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THE JOHN

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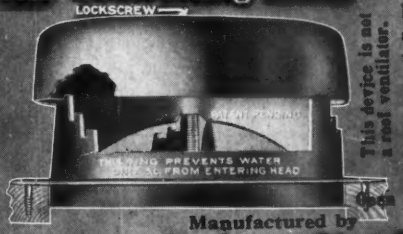

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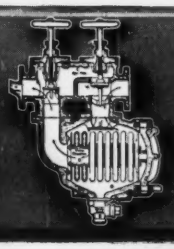

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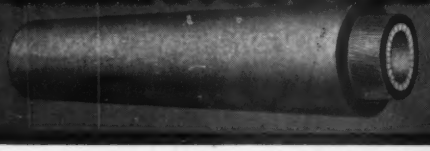

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Expansion tank can be placed either above radiation or in the basement

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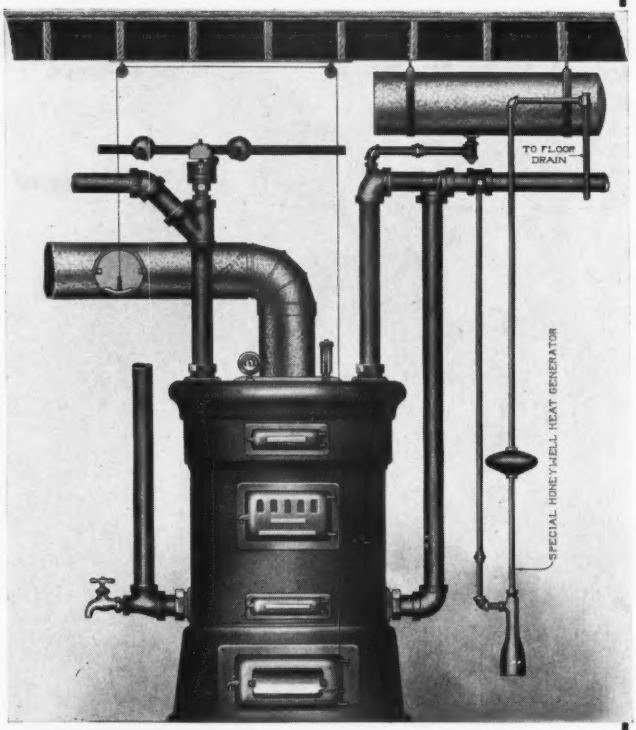

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The need of a dependable Tank-in-Basement method has existed ever since hot water was first used for heating purposes. Fitters, architects and heating men have been wanting it for certain installations for a long time. But we wouldn't hurry—we wanted to be absolutely sure that it was right—all right—right in every detail, before we brought it out.

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Wabash, Indiana

THE HEATING AND VENTILATING MAGAZINE

1123 BROADWAY NEW YORK JUNE, 1915

Heating and Ventilating an Office Building by Electricity

NOVEL EQUIPMENT FOR THE HYDRAULIC POWER CO.'S PLANT AT NIAGARA FALLS, NEW YORK.

By C. F. HERINGTON.

There has recently been completed at Niagara Falls, N. Y., a new office building for the Hydraulic Power Co. The office building is built of rough stone and is so situated on top of the cliff just below the Falls that at times it lies directly in the path of an 80 mile an hour gale.

The power plant, containing the generators and other machinery, is located approximately 230 ft. below the office and intake building, as shown in Fig. 2, the office building being to the right and top of the picture, with the flag on top of the elevator tower. All of the stone

FIG. 1—OFFICE AND INTAKE BUILDING, PLANT OF HYDRAULIC POWER CO., NIAGARA FALLS.

used for constructing the buildings was excavated from the canal, which extends from the power plant through the streets of the city to a point about one mile above the Falls.

This company furnishes mechanical power to factories and other industries located in Niagara Falls only, and, as the cost of electricity generated at Niagaga Falls is exceedingly low, the company decided to take a new and novel step and heat their office building throughout by electricity.

trates only one section, however. The heater itself is made up of 10 such sections, and by a simple arrangement can be lowered through the platform upon which it rests by a trap-door placed directly underneath it.

After going through the coil heater, the air is drawn through a Bicalky air washer, having a capacity of washing 15,000 cu. ft. of air per minute; details of the air washer are shown in Figs. 7, 8 and 9.

Fig. 9 shows a longitudinal section

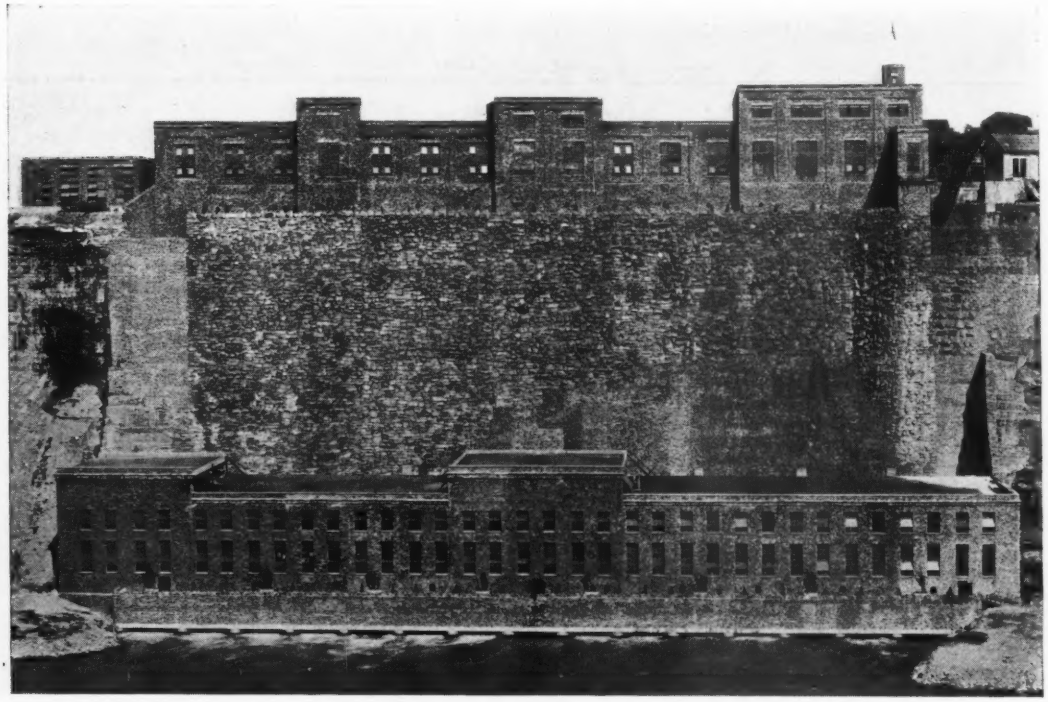


FIG. 2—POWER PLANT OF HYDRAULIC POWER CO., AT BASE OF CLIFF, NIAGARA FALLS.

Fig. 3 shows a plan of the piping, which was run in a place especially designed for that purpose, as shown in a sectional elevation, Fig. 4. Note how the air is carried up and across the intake bay and machine shop, and then dropped down to heat the floors below that level. This is only one of the novel features of the design.

Referring again to Fig. 3, the air is taken directly in through a part of the louvre window marked "E" on the plan, and is drawn in and through the sectional electric coil heater, a detail of which is shown in Fig. 16, which illus-

through the air washer, looking directly in the direction the air is passing through the washer. In this figure "A" represents the priming pipe, which gives two sources of supply, one to the pump and the other to the tank in the air washer. "P" represents a centrifugal pump of the Economy Pumping Machinery Co.'s make, and has a capacity of 185 gals. per minute, at a speed of 1,100 r.p.m. It is driven by a 3 H.P. motor. "S" is the suction pipe, which is 3 in. in diameter, and which projects inside of a round revolving screen "F," covered with No. 24 brass mesh screen. Inside of this re-

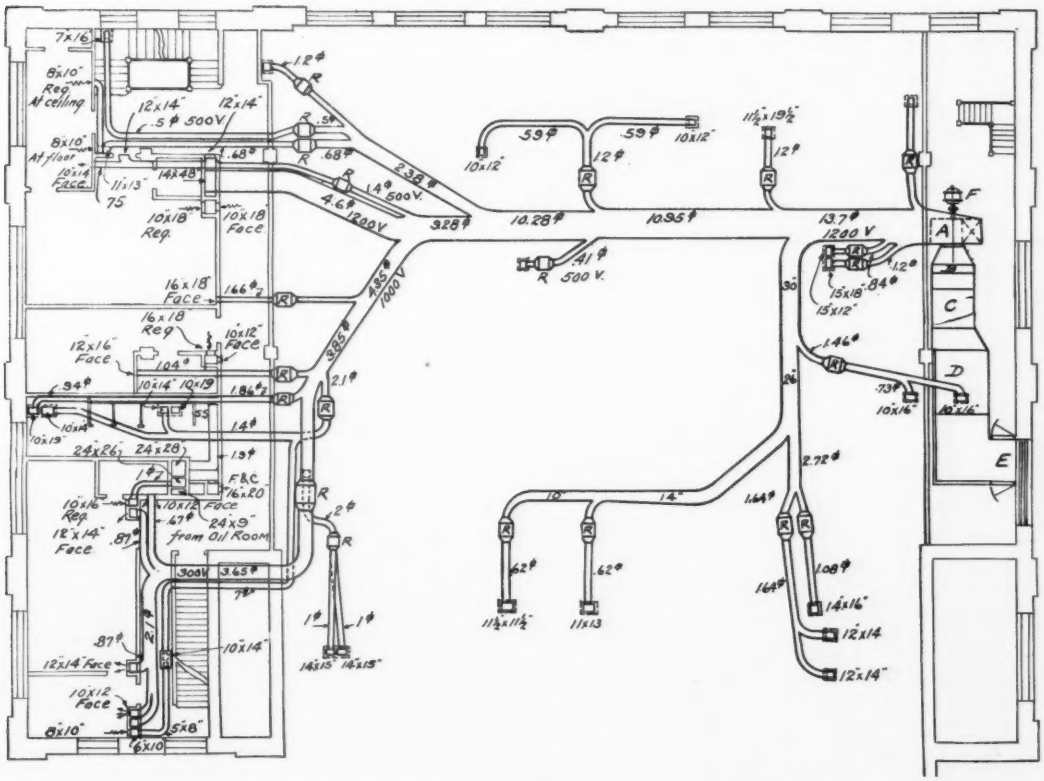


FIG. 3—PLAN OF AIR PIPING IN OFFICE BUILDING OF HYDRAULIC POWER CO., SHOWING LOCATION OF ELECTRIC HEATERS.

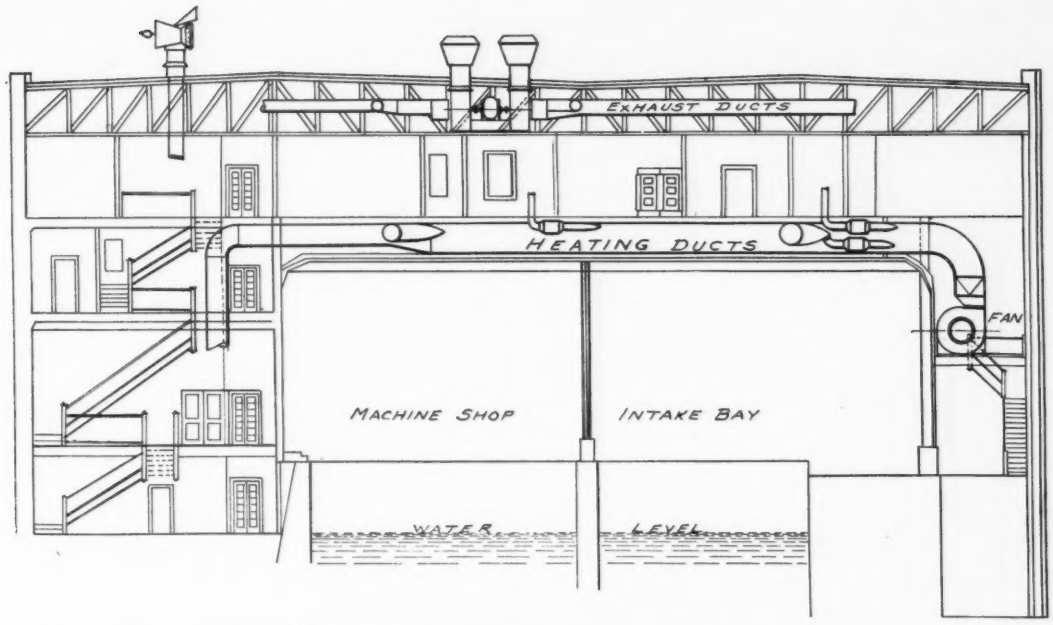
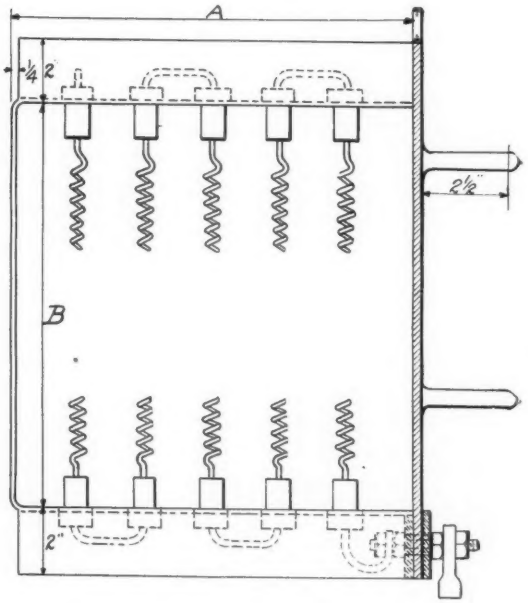


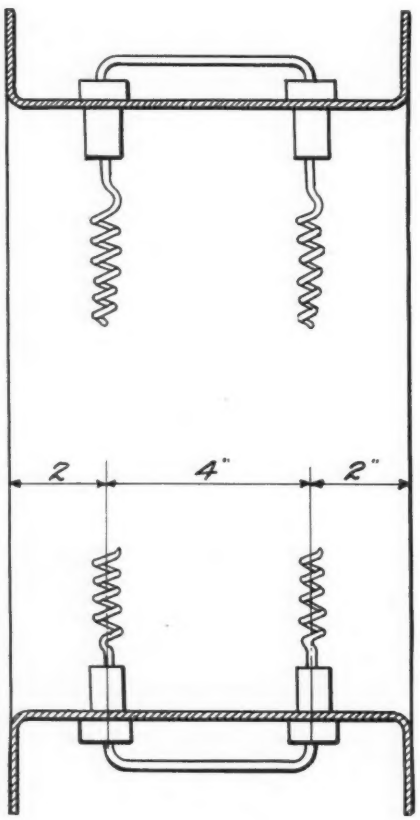
FIG. 4—SECTIONAL ELEVATION OF OFFICE BUILDING OF HYDRAULIC POWER CO., SHOWING ARRANGEMENT OF AIR PIPING.

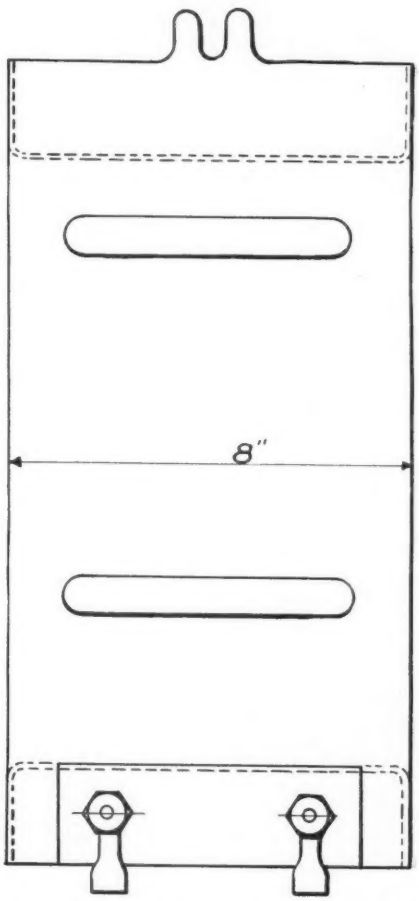
volving screen, as shown on the drawing, there are placed several spray valves or nozzles similar to the ones marked "J," which are used to keep the small particles of dust and dirt away from the screen, so that the pump is drawing clean water through its suction pipe.

By referring to Fig. 8, it will be noted how this screen "F" revolves. "C" represents small galvanized iron buckets, and as the water drops through the spray nozzles "J" the buckets become filled and overturn, which revolves the camshaft "G" (Fig. 9), which in turn revolves the screen by means of a sprocket chain "K."

The nozzles "J" are spaced as shown in Fig. 9, and back of each row of nozzles is placed a spray nozzle flushing rod marked "H," which is connected to the camshaft by means of a roller "R," which, running upon the cam, has a vertical movement up and down. Attached to this rod "H" are little pushing rods







FIGS. 5, 6—DETAILS OF ELECTRIC COIL HEATER, PLANT OF HYDRAULIC POWER CO.

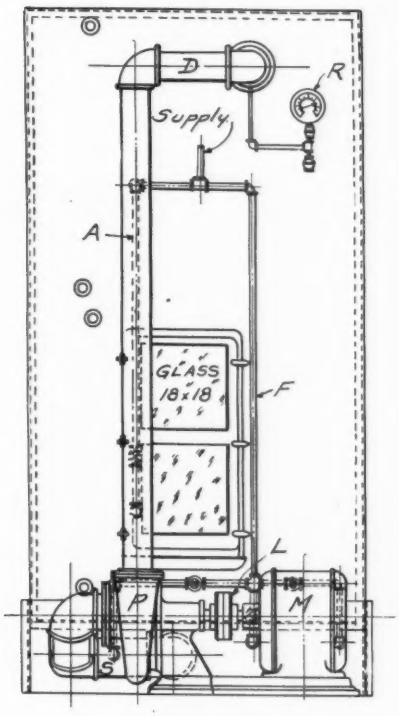


FIG. 7—OUTSIDE VIEW OF AIR WASHER, SHOWING PUMP AND MOTOR.

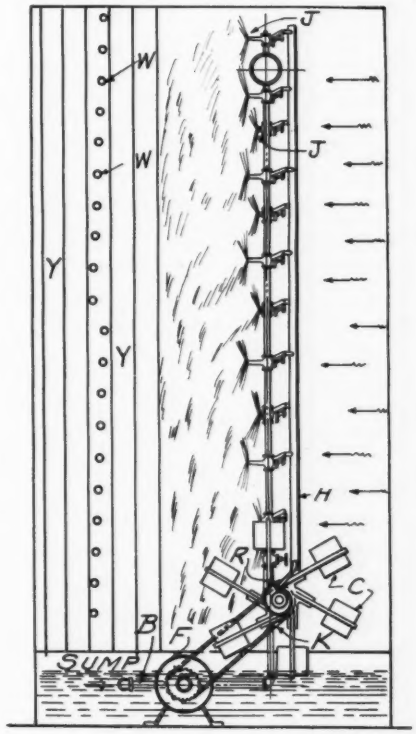


FIG. 8—DETAIL SHOWING METHOD OF REVOLVING SCREEN IN AIR WASHER.

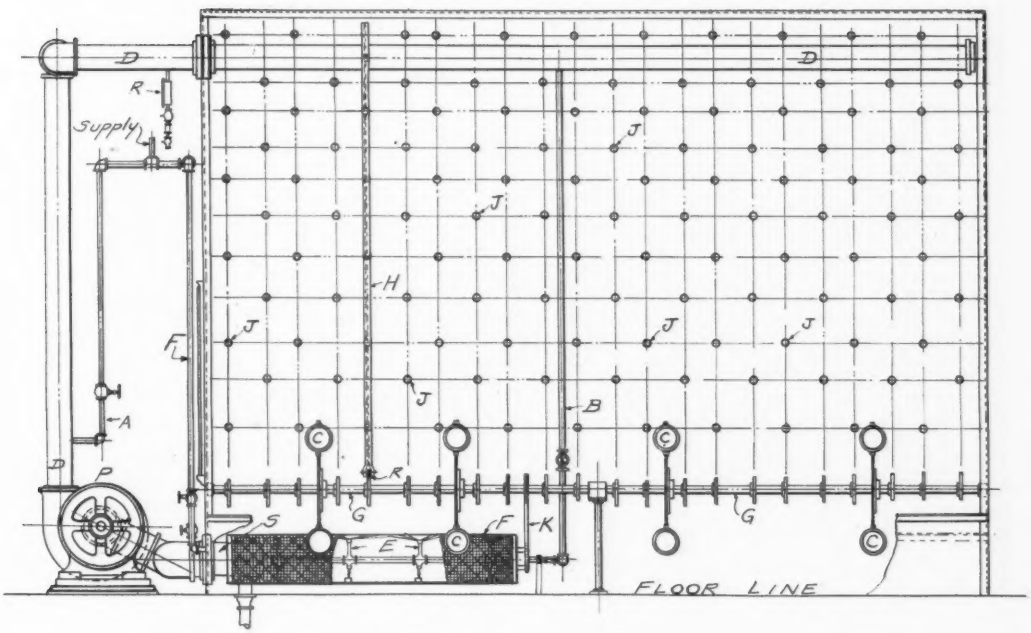


FIG. 9—LONGITUDINAL SECTION THROUGH AIR WASHER.

behind each spray nozzle, which push out the sprays, so that the force of the water coming behind them cleans out particles of dirt. As the cams are so fixed on the shaft "G" that no two vertical lines of nozzles are being cleaned at the same moment, the cleaning process does not interfere with the washing of the air.

"B" in Figs. 8 and 9 indicates the screen flushing water pipe taken from the main discharge pipe "D" and supplying the spray nozzles in the revolving screen "F." In Fig. 8 "W" represents the humidifying coils and "Y" the eliminator plates. Fig. 7 is an outside view of the air washer showing the pump "P" and the motor "M," which are connected together by means of a flexible coupling "L," and the discharge pipe "D" having a pressure gauge "R." "A" represents the priming pipe, as in Fig. 9, and in the washer there is a large glass door, as shown, so that easy access can be made into the washer for repairs or examination.

ARRANGEMENT FOR COOLING AIR IN SUMMER.

Another novel feature with this equipment is the method of introducing cold water for cooling purposes in the summer. Referring to Fig. 9, pipe "B," which leads from header "D" to strainer, has a valve; this valve is closed in summer and valve opened in pipe "F," which leads to the nozzles "E" inside of pump suction strainer. In this way the fresh cold incoming water surrounds the pump suction pipe and after passing the suction strainer is drawn into the pump and discharged through the nozzles "J" to wash the air.

With this method the fresh water supplying the air washer does not come in contact and mix with the balance of the water in the sump, but is immediately drawn into the pump and discharged at the nozzles "J," thereby being at a much lower temperature than the balance of the water in the sump. This brings the air passing through the air washer to a much lower temperature than has been heretofore accomplished with air washers and adds no additional expense.

After passing through the air washer "C" and going through the humidifier "B," as shown in Fig. 9, the air is drawn into the fan "A," which is a No. 9 Bi-Multi, and is driven by a 5 H.P. 250 R.P.M. motor "F." The air is discharged into ducts at a temperature range of 50° to 80° F., while the velocity at the discharge outlet of the fan is approximately 1,200 ft. per minute. From these ducts the air is carried through this pipe space (Figs. 3 and 4) and dropped to the different offices, where it enters the rooms through register faces at a height approximately 7 ft. above the floor. At the time the air enters the offices it has lost some of its temperature

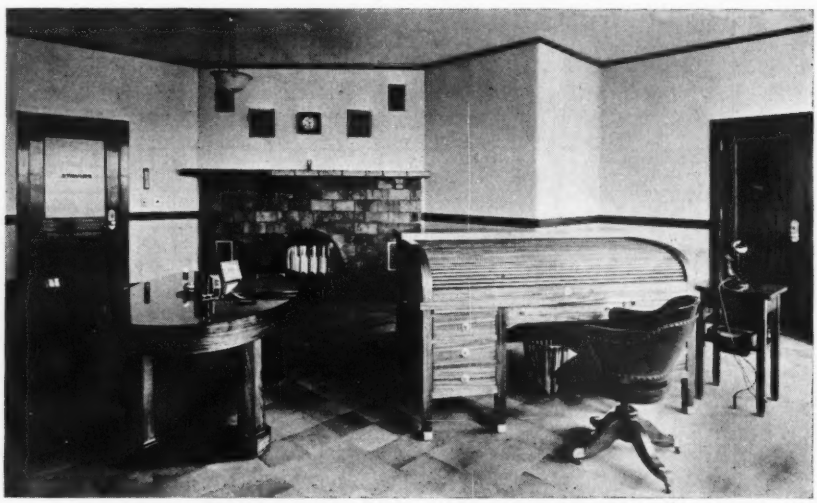


FIG. 10—ONE OF THE PRIVATE OFFICES, HYDRAULIC POWER CO., SHOWING AIR SUPPLY AND VENT REGISTERS.

due to friction and other air losses, so that it is about 50°.

INDIVIDUAL ELECTRIC REHEATERS.

The occupant of each office has a thermometer hanging on the wall and whatever temperature he desires, according to the weather outside and the location of his office in regard to the prevailing winds, is obtained by pressing a button switch in the wall and in a few minutes the air is reheated just before it enters the office by an electric coil heater containing one or more sections of the coil shown in Figs. 5 and 6. The location of reheater coils are shown and designated by the letter "R" in Fig. 3.

In Fig. 5 the dimension marked A has three different sizes as 12, 18, 24-in., while B is 12, 15, 24-in. for its corresponding dimensions, as different sizes of heater are required for the different size rooms.

In Figs. 10 and 11, which are photographs of two of the private offices, the register faces for the incoming air are shown one on each side of the clock, while the vent faces are shown, two above the heat registers, and two near the floor in the fireplace (Fig. 10). The floor vent faces cannot be seen in Fig. 11, but they are the same height above the floor as in Fig. 10 and in the same position as the upper vent faces. Referring to Fig. 10, the upper vent faces have registers, which in the winter time are always kept closed, while the lower vent faces have no register faces, and the air flows out into the corridors (Fig. 12), with the result that the corridors are heated by the air, which is drawn from the outer offices. The corridors have a register face which is connected to a duct, and the air is drawn out by the fans in the attic space as shown in

FIG. 11—ANOTHER PRIVATE OFFICE, PLANT OF HYDRAULIC POWER CO., ALSO EQUIPPED WITH AIR SUPPLY AND VENT REGISTERS.

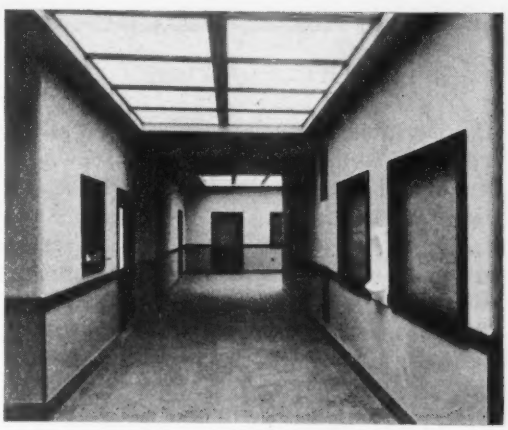


FIG. 12—VENT REGISTERS IN CORRIDOR, HYDRAULIC POWER CO.

Fig. 4, and discharged out through the ventilators on the roof as shown in detail in Fig. 15. This is a detail of the specially designed hood through which the exhaust air from the fans passes to the atmosphere.

There is no heat put in the corridors except through the vent outlets from the offices, with the exception of two places, where there are large stair wells and heat is required.

THE AIR COOLING SYSTEM.

The upper vent registers, which are closed in the winter time, are connected to ducts, which in turn are connected to the fans in the attic space, so that in the summer time the offices have all the vents opened. The hot air is drawn out through the top vent faces and the corridors draw out the air through the vent faces. Of course, the electric heaters are not used in the summer time and are dropped out of the way. The fan takes the comparatively cool air from the top of the cliff, and this air is drawn through the air washer and further cooled by coming in contact with the water, so that the heat registers in summer time are discharging into the offices and rooms cool and washed air, and the fans are drawing out the hot air, thereby maintaining ventilated offices without the use of electric fans.

The toilet rooms take their heat from the corridors through registers at the floor line and each toilet room is connected to the exhaust fan in the attic space by a duct running back of each closet. An outlet is placed just back of the seat and outlets are also placed about 8 ft. above the floor, so that the ultimate result is a constant changing circulation of air through the toilet rooms, leaving no chance for any odors to accumulate.

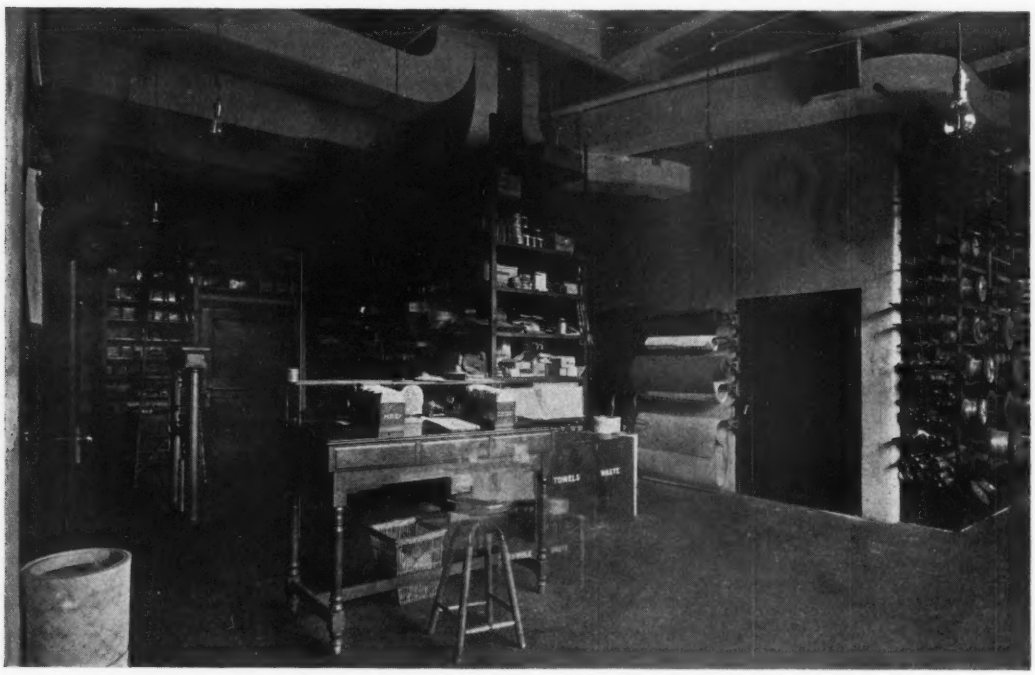


FIG. 13—SOME OF THE DUCT WORK IN PLANT OF HYDRAULIC POWER CO.

In the slop room off each corridor there is placed directly above the slop sink in the ceiling a vent face connected to the exhaust fans in the attic space, so that there is no odor in this room, nor does any escape in the corridor. This is another one of the novel features in the design of this system.

In Fig. 13 there is shown a photograph which gives one a very good idea of the splendid duct work which was done throughout the job. The writer has never seen any better sheet metal work than

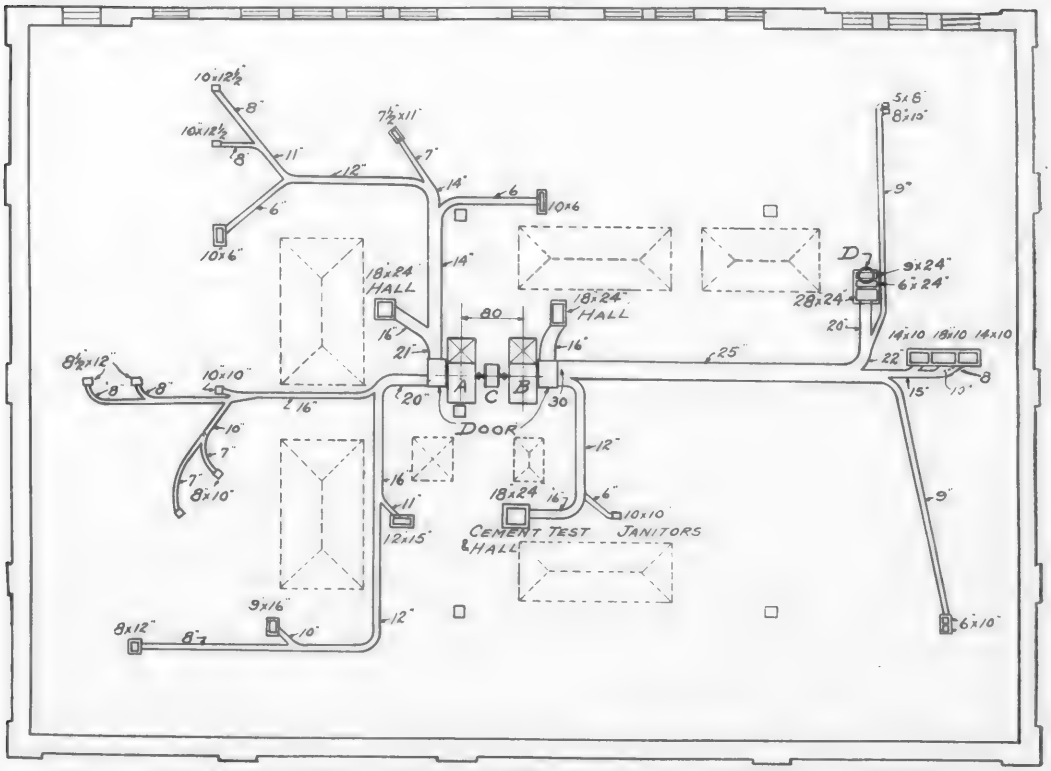


FIG. 14—EXHAUST VENTILATING SYSTEM, PLANT OF HYDRAULIC POWER CO.

that in this plant. In the picture there is shown the storeroom and the door to the right is the door leading to the oil room, which is air-tight, with a duct, which can be seen, leading out of the room. This duct goes directly up through the roof, where it is connected to a Bicalky 24-in. roof fan ventilator, so that the oil room is fireproof in every way. The location of this ventilator is shown in Fig. 14 and the elevation in Fig. 4.

Fig. 14 shows a plan of the exhaust

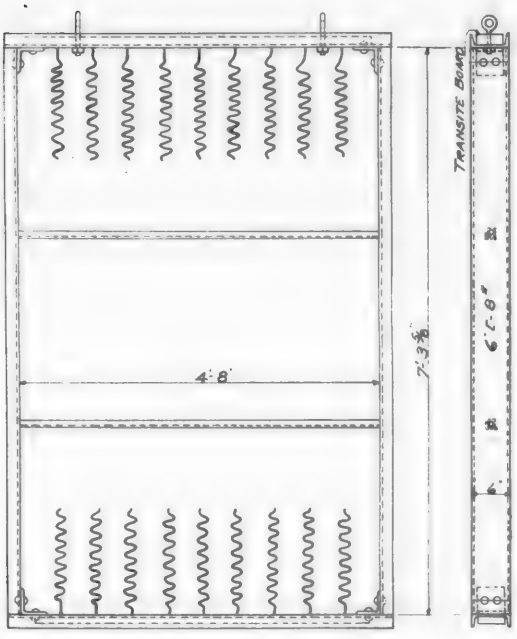


FIG. 16—DETAIL OF SECTIONAL ELECTRIC COIL HEATER IN THE AIR INTAKE.

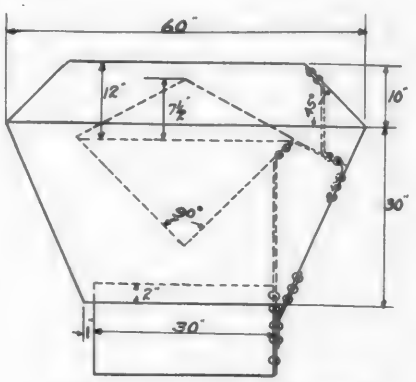


FIG. 15—DETAIL OF ROOF VENTILATOR.

system and is self-explanatory. The fans "A" and "B" are special double 60-in. fans, direct connected to a 5 H.P. 220 volt motor "C" running at 385 R.P.M. Fan "A" has a capacity of exhausting 5,000 cu. ft. of air per minute, and fan "B" has a capacity of 6,000 cu. ft. of air per minute. Each branch connection of duct is provided with a lock regulating damper.

In conclusion it should be mentioned that this system of heating and ventilating has been in operation for two years and is giving perfect satisfaction.

The contractor for this work was the Bicalky Fan Company, of Buffalo, N. Y., and the entire work was designed and installed under the personal supervision of C. H. Bicalky, president of the company.

The writer takes this opportunity to thank John L. Harper, chief engineer; Geo. R. Sheppard, mechanical engineer; O. D. Dales, designing engineer, and M. E. Chesbro, all of the Hydraulic Power Company, for the courtesies extended to him in the preparation of this article.

The Cost of Schoolhouse Construction

With A Proposed Unit Based on Cubical Contents.

By Edward C. Baldwin,

Business Agent, Massachusetts Board of Education.

(*From a paper read before the National Association of School Accounting Officers at St. Louis, May* 19, 1915.)

It is said that the expenditure for new schoolhouses in the United States is about $102,000,000 annually, and the cost of repairs on old buildings is in excess of $35,000,000 annually.

The employment of architects and of engineers is no small part of the work of a school board or committee. Most of these boards and committees are made up of men and women who, although they are representative members of the community, have no data available regarding comparative costs, and it is a perfectly easy matter for an architect or an engineer to get their approval on extravagant propositions. It frequently happens that both the architect and the engineer are influenced by the extravagant notions of the school officials who demand equipment and facilities in excess of their needs. Ultimately the cost of all of these things must show in the total cost of the building, and if this, in turn, is reduced to a cost per cubic foot which can be compared with the cost of similar buildings in other communities the extravagance would be exposed.

The principal task set for me is to suggest definitions of certain units of cost of schoolhouse construction and repair, and a plan whereby these units may be used in the everyday work of accounting.

It is now almost impossible to compare the work of one architect or engineer with that of another, or to measure in precise terms the results of their efforts. When an attempt is made to compare the cost of one building with the cost of another, we often find ourselves utterly helpless because of the lack of a unit of measurement which is uniform, standard and generally accepted (the same in one place as in another). The object of this paper is to suggest such a unit, and to urge its adoption.

Classification of School Buildings.

The first step necessary towards this end is to classify our buildings by types according to use, then by types according to construction.

A. *According to Use.*—In elementary school work there are two types of buildings which we may call Elementary "A," and Elementary "B." *Elementary "A"* is a building used for lower and upper elementary grades only. *Elementary "B"* is a building used for lower and upper elementary grades, but in addition to the regular classrooms contains rooms for manual training, cooking and assembly hall or gymnasium.

Secondary schools may be grouped as follows:

High "A," a classical high school. A building containing ordinary class and recitation rooms and laboratories for elementary sciences, usually with hall and library.

High "B" a commercial high school. A building containing ordinary class and recitation rooms, rooms with special equipment for commercial branches, usually with hall, library and museum, and laboratories for elementary sciences.

High "C," a technical high school. A building containing in addition to ordinary class and recitation rooms, rooms with special equipment for household and industrial arts and equipped with special machinery or apparatus for the teaching of the principal technical branches required.

High "D," a suburban high school. A building which combines any or all of the features of High "A," "B," and "C."

High "E," a rural high school. A comparatively small building designed for the small or rural community which will contain classrooms, library, science rooms, etc.

Normal "A," a normal school. A building containing ordinary class and recitation rooms, usually with hall, library and elementary science rooms, used for the training of school teachers.

Note: All of the above, except High "E" may contain assembly hall, or gymnasium, or both.

Frequently in a modern rural school there is a general study room fitted with movable seats.

Dormitory "A," adapted for students' living quarters, containing sleeping rooms, baths, living rooms, parlors, library and office.

Dormitory "B," the same as type "A," but with dining room, kitchen and laundry within the building.

Dormitory "C," the same as type "A," but with dining room, kitchen and laundry in separate buildings adjoining, or attached to, the dormitory building.

B. *According to Construction.*—These buildings can be divided into three classes according to their construction, and we may call these divisions First Class, Second Class, and Third Class.

A First Class building is one constructed entirely of fireproof material, with nothing inflammable except classroom floors, the tops of which, as well as the trim, casings, and doors, may be of wood, but metal trim is now often used.

A *Second Class* building is one of semi-fireproof construction, with brick, stone, or concrete outer walls, brick firewalls, fire-stopping between all partitions, fireproof stairs and stairways, with wood timbers, rafters and studding and expanded metal or wood laths and plaster partitions, wood floors, casings, doors and trim.

A *Third Class* building is one constructed entirely of wood.

Having thus classified our buildings it will be a simple matter to refer to them as of *High "A," First Class* construction, *Elementary "B," Second Class* construction, *High "E," Third Class* construction, etc., etc.

COST UNIT.

The unit of cost should be the cost per cubic foot, but the method of obtaining cubage should be defined with precision. Upon the question of how the cubage, or cubic feet, should be obtained there are many opinions. Some obtain the cubage by a measurement of the extreme outside dimensions of the building, others by the inside dimensions of the outer walls. Some use the height from the basement floor to the peak of the roof, others to the mean of the roof, others from the top of the foundation to the cornice, and still others from the bottom of the footings to the cornice. Few architects seem to agree as to what is the proper method to adopt in determining the cubage, and because of this disagreement comparisons of cost based upon the cubic foot are often misleading and generally unreliable.

I believe that the standard which we should adopt is the *cubical contents* of the building. This should be defined to mean the cubical contents of the space or the rooms actually used, or available, for school purposes, such, for example, as classrooms, coat rooms, assembly halls, corridors, stairways, play rooms, offices, lunch rooms, sanitaries, storerooms, engine and boiler rooms, coal rooms, stack rooms, fan rooms, etc., but should not include attic spaces, or other

parts of a building which cannot be used for school or its related work.

I fully understand that the acceptance of this standard will not at the outset be unanimous. The fact that architects generally disagree as to the proper way to figure cubage makes this statement easily understood. There may be good reasons advanced by some why the "cubic contents" of a building is not as good a standard as some other, but the time has arrived when a decision should be made, when we should cease our haphazard measures and adopt a standard. It has been left for some one with power to enforce a decision to adopt a standard. The power is here in this organization. It is for us to determine if we are measurably right, then to have the courage to back up that determination.

In adopting a standard for the computing of costs of school buildings we should not be too much concerned as to whether the unit adopted is absolutely accurate, or based upon indisputable scientific principles. The thing we should be concerned with is that it is reasonably correct, more nearly correct than any other unit we can, at this time, adopt, that it is possible of application, and then we should decide that it shall be our *standard of measurement.*

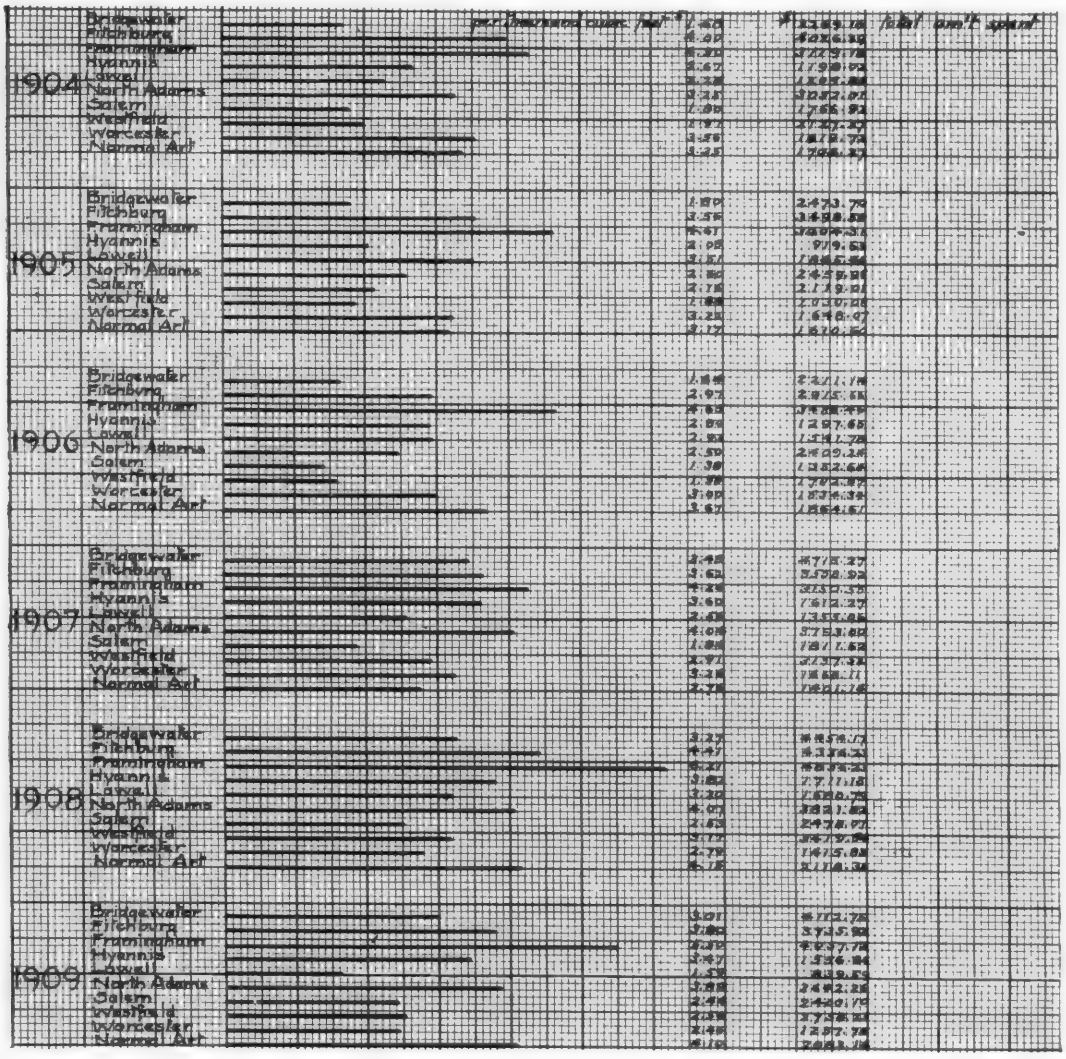


CHART SHOWING THE AMOUNTS EXPENDED BY THE MASSACHUSETTS NORMAL SCHOOLS FOR HEAT, LIGHT AND POWER FROM 1904 TO 1909, FIGURED PER THOUSAND CUBIC FEET.

To the use of cubic contents, as defined above, some objections may be offered, and these objections may have some reasonable basis, yet I shall attempt to show that the cubical contents of the building will give a more certain basis for an accurate estimate of the size of a building than any other, and it will certainly be superior to the haphazard, "go-as-you-please," "everyone-for-himself" method of determining cubage used at present.

The cubic contents of the building has additional interest to us as school officers. With it we may not only estimate the cost of a building, but also the cost of repairs, the cost of heating, of lighting and of cleaning the building. These are subjects with which the architect and engineer have little to do, but they are important matters to consider.

To illustrate the value of the adoption of this standard, cubic contents, I have incorporated in this paper diagrams showing the application of this principle to the cost of repairs, improvements, heat, light, power and furnishings in ten of the normal schools of Massachusetts.

The first, shown herewith, is a diagram showing the amounts expended by normal schools in Massachusetts for heat, light and power from 1904 to 1913.

In columns on each of these diagrams are shown the cost per thousand cubic feet and the total amount expended. To illustrate these figures I have drawn lines in exact proportion to the cost and showing the relation of one to the other.

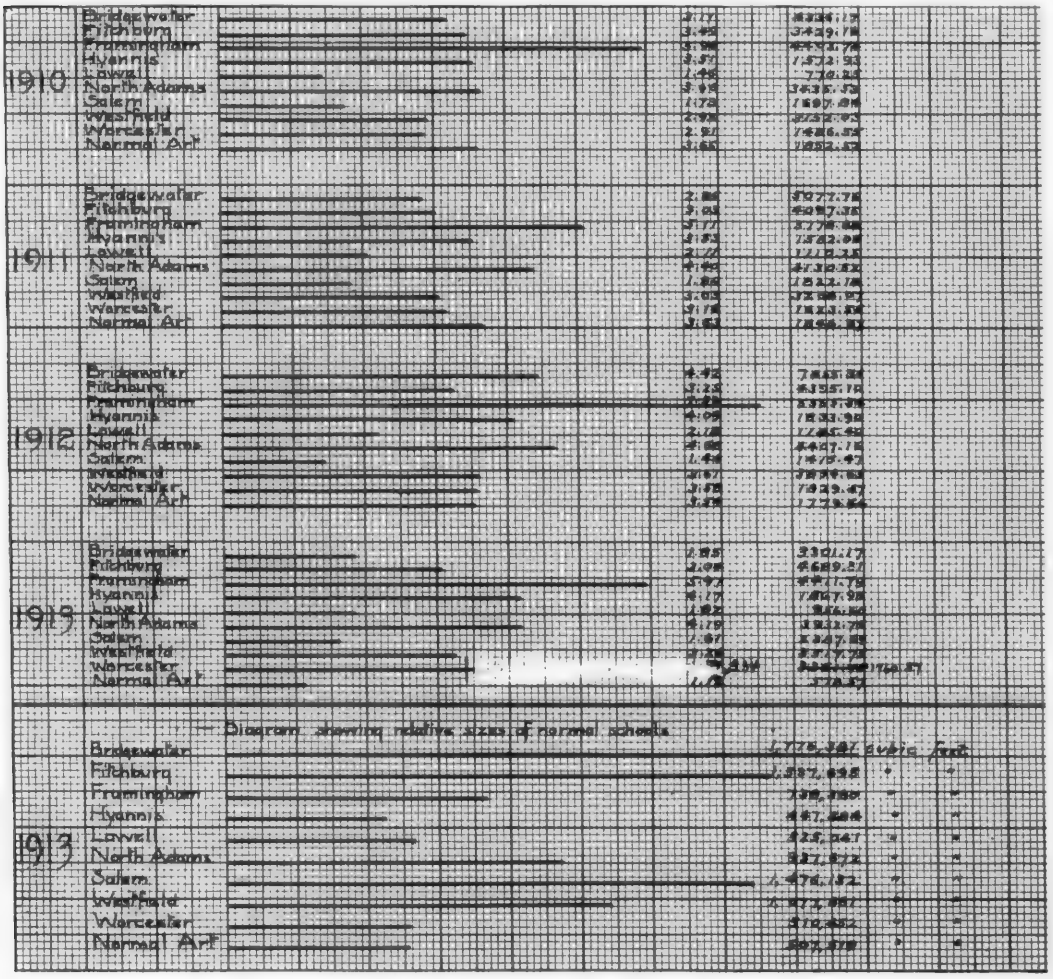


CHART SHOWING THE AMOUNTS EXPENDED BY THE MASSACHUSETTS NORMAL SCHOOLS FOR HEAT, LIGHT AND POWER FOR 1910 TO 1913, FIGURED PER THOUSAND CUBIC FEET.

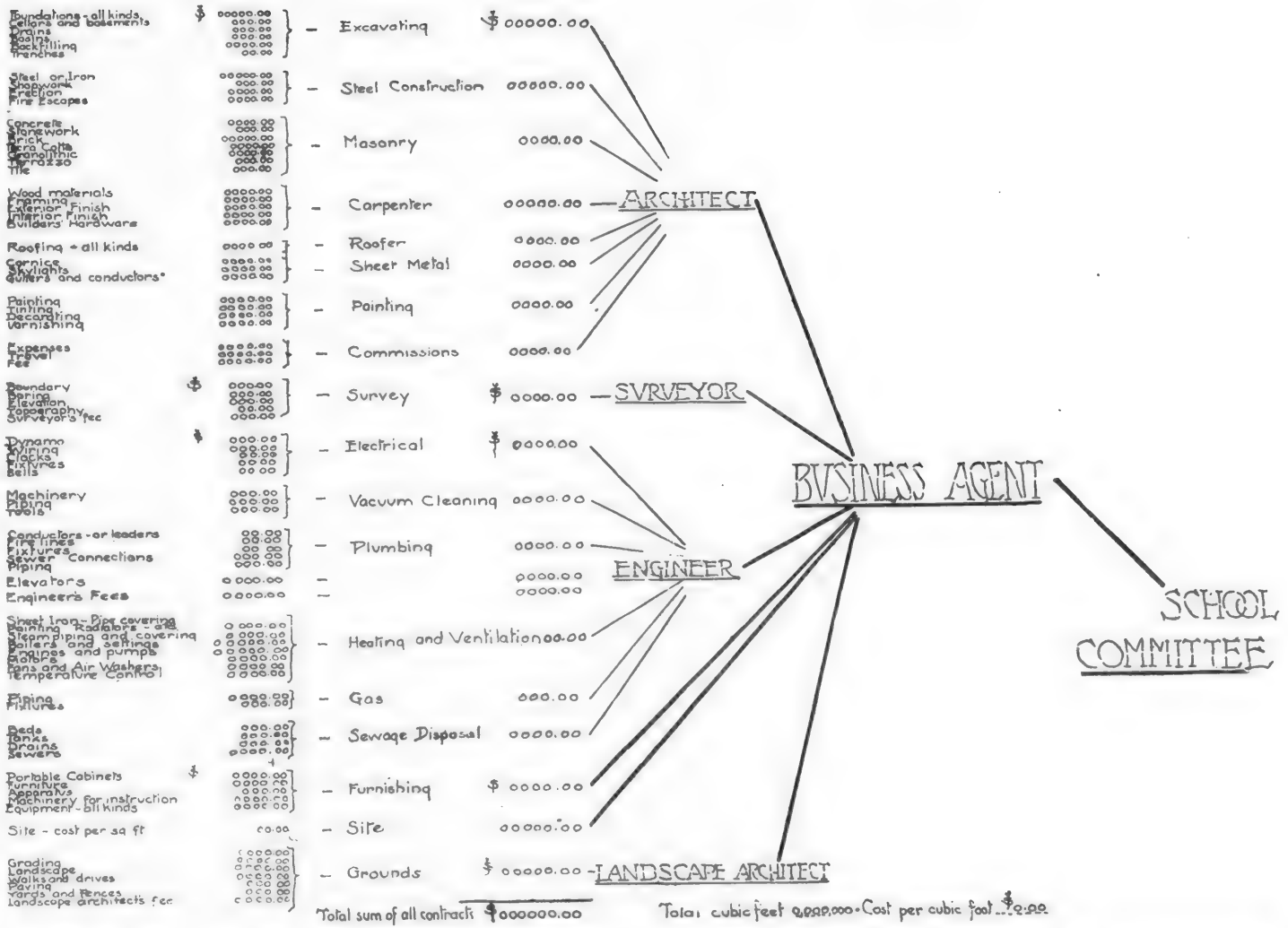


DIAGRAM OF COST AND ORGANIZATION OF THE WORK INVOLVED IN THE CONSTRUCTION OF A SCHOOLHOUSE IN MASSACHUSETTS.

(Drawn in the office of the Masschusetts Board of Education, May, 1915.)

A study of these diagrams shows a radical difference in the costs for the several schools. Not only does it show the difference in the cost of each school in relation to the other schools, but it shows the increase or decrease in the cost of each school from year to year.

I think that you will agree that a study of these diagrams is most interesting and enlightening to the board having control of such institutions.

It will be seen that when considering, for example, the subject of heat, light and power, the effect of different types of heating apparatus, difference in equipment, differences in effectiveness of employes, and in the kind of fuel used, are very clearly shown. With diagrams of this kind accurate estimates can be made and those in authority have something definite and reliable upon which to base their reasons for action.

The application of this standard in this practical way to the normal schools of Massachusetts is a very good indication of what may be found by its application to other schools in other states or cities of the country.

ITEMS INCLUDED IN THE COST OF BUILDING.

Having determined the unit upon which the cost of construction should be based, it is equally important to determine what items of expense should be included in the cost of a building.

Perhaps it has come within the experience of each one of you that the final cost of a building has overrun the estimate because of the omission of very important details. It is imperative, therefore, that every detail should be included in the total cost before this cost is divided by the cubic contents of the building to get the cost per cubic foot. To illustrate, I will call your attention to another diagram.

COST PER CLASSROOM.

It may be suggested that the cost per classroom is a better unit than that suggested here. It would, perhaps, be better if there were any uniformity as to our buildings, but there is none. The cost per classroom in a building containing twelve classrooms only, may be one sum, but the cost of a twelve-room building with assembly hall, manual training room, cooking room and sewing room, will be entirely different. It must be evident that no comparison can be made between two such buildings on the basis of cost per classroom, or per pupil, notwithstanding the fact that both buildings might accommodate the same number of pupils.

There is no objection to adding to our plan information showing the number of pupils and the cubic contents per pupil, in fact, I believe that is a highly desirable thing to do. By so doing a comparison between types of buildings could easily be made. For example, one building may show that the cost is fifteen cents per cubic foot, and the number of cubic feet per pupil is 18,000, while the cost of another building is fifteen cents per cubic foot and the number of cubic feet per pupil is 30,000. If these figures were exact they would show that one architect, or school board, had been more economical with space than the other, or that in order to reduce the total cost of the building one architect, or school board, had greatly restricted the space per pupil.

It may be possible that in the future standard specifications will be agreed upon calling for a definite number of cubic feet per pupil for each type of building, and a direct comparison of the cost per cubic foot can then be made very readily.

By the adoption of the standard I have outlined above, this desirable end may be readily accomplished, and all discussions that arise as to the cost of the whole, or any part, of the building can be compared.

SUMMARY.

The adoption of the plan suggested involves the following:

1. Classifying buildings by types according to their use.
2. Rating them in accordance with their construction.
3. Computing the actual cubic contents of all usable space.
4. Dividing the total cost by the cubic contents to determine the cost per cubic foot.
5. Dividing the total cubic contents by the number of pupils to determine the cubic feet per pupil.

District Heating

By S. Morgan Bushnell and Fred B. Orr.

Heating and Power Costs.

(*This series of articles commenced in the January, 1915, issue.*)

The costs to be included for isolated plant operation are:

1. Annual fixed charges which are based on the cost of the boilers, engines, dynamos, piping, furnaces and building space required for the installation of the plant.

2. Operating costs which include the items necessary for the operation of the plant after it is installed.

Under fixed charges, we have:

(*a*) Amortization, which means the amount of money which needs to be set aside each year in order to replace the plant at the expiration of its usefulness. This is usually figured at about 3% of the first investment.

(*b*) Obsolescence, which is a term used to express the loss in value due to change of conditions. The more important of these changes are changes in the business itself, requiring different types or sizes of apparatus than that originally installed. 2. Improvement in the types of apparatus manufactured, thereby making old apparatus obsolete and unsatisfactory. 3. Reduction of rates by the central-station companies, making the investment unprofitable long before the machinery is worn out. The item of obsolescence is variously estimated, but an average estimate would be about 5%.

(*c*) Interest. Interest rates vary from time to time, but considering the risk of a plant installation, 6% may be considered as a fair rate of interest.

(*d*) Repairs. The item of repairs is often included in operating costs, but as it varies so much from year to year and is usually higher as the plant grows older, in order to get an average cost of repairs it is simpler to take a fixed percentage of the cost of the plant as the average cost of repairs, and this is usually placed at 2%.

(*e*) Taxes. Taxes vary in different localities. In cities like Chicago, the item of taxes runs from one to one and one-half per cent., but an average would probably be one per cent.

(*f*) Another fixed charge which can be estimated in two ways is the rental value of space. 1, as the value which could be secured by renting the space to the tenant, or 2, it can be figured on the basis of the interest and depreciation on the building investment necessary for taking care of the isolated plant. Often in large cities where space is valuable, very expensive excavations are made in order to provide space for the independent plant. If the annual fixed charges on these excavations is added to the operating cost, it is found that the plant has been an expensive luxury.

(*g*) To the above charges should be added what is sometimes called "the marginal cost" of operating a plant. This cost is estimated on the following basis:

Almost every large business is limited by its ability to secure capital to carry on the business. If a business is a profitable one, there is usually a considerable margin over the actual cost of borrowing money—perhaps 15% would be the average turnover on the money invested in a private business. If money is used in the installation of a private plant, it means so much capital deducted from the business itself, or else it means a straining of the credit of the organization. It is very frequently found that owners will invest large sums of money in private plants only to find that they have made unprofitable investments and at the same time have taken money from their business which is very much needed. While it might not be fair to charge the entire difference between the cost of money and the average annual profit, yet the marginal charge is without doubt a reasonable one and an average estimate might be placed at 5%.

The operating in connection with a private plant may be sub-divided into two main divisions, viz., salaries and supplies.

Salaries include wages paid to engi-

neers, boiler-washers, plumbers, steam-fitters, electricians, oilers, firemen, coal-passers, engineer's clerk and such office help as is required for looking after the operation of the plant. The time of the manager of the organization or owner which would be taken up in the supervision of a power-plant organization should also be included.

Supplies include coal, transportation of ashes, oil, waste, water, shovels, fire-tools, electricity for light, power and ventilation, and handling of coal in boiler and engine-rooms, lamps, carbons, miscellaneous supplies.

These items may be given in tabulated form as follows:

1. *Fixed charges based on investment in*

Building,
Boilers,
Piping,
Dynamos,
Furnaces,
Engines,

and various accessories for the above.

(*a*) Amortization.
(*b*) Obsolescence.
(*c*) Interest.
(*d*) Repairs.
(*e*) Taxes.
(*f*) Rental value of space.
(*g*) Marginal charge for diversion of capital.

2. *Operating Costs.*

Salaries.
- Chief Engineer.
- Assistant Engineers.
- Firemen.
- Coal-Passers.
- Oilers.
- Electricians.
- Steam-fitters.
- Boiler-washers.
- Elevator repair men.
- Helpers.
- Engineer's clerk.
- Office labor for metering and billing.
- Employer's liability insurance and salaries paid to injured employees when off duty.

Also a portion of the time of the management used in buying supplies and looking after the operating organization.

Supplies.
- Fuel.
- Transportation of ashes.
- Oil, waste, water.
- Shovels, fire-tools.
- Electricity for lighting and power in boiler-room.
- Boiler and fire insurance.
- Miscellaneous supplies and expenses.

All of the above are direct costs which are directly chargeable to the cost of operating a plant. In addition to the above costs, there are other costs which might be termed indirect charges which often come as a result of power-plant operation.

1. Throw over switch service from central-station service. As a rule the cost per K.W. hour for throw-over switch service is greater than the rate where complete service is furnished, and often a minimum bill is required in addition to the higher rate.

2. Danger of breakdown in the service and consequent loss if throw-over switch is not installed.

3. Losses on account of decreased rental value of the building. The majority of isolated plants operated with high-speed engines, shows a marked fluctuating quality in the light. This is usually increased at irregular intervals where high-speed electric elevators are operating on the same plant. It is also frequently found that in the summertime the space directly above the boiler is hard to rent on account of the heat coming up through the floor from the engine-room below. There is also the damage and annoyance caused by vibration in the building.

4. Losses of time on account of obstruction of entrances by coal teams. Some of the firms which have discontinued the use of their own plants and gone on central station service have been particularly desirous of getting the steam service also in order that they might discontinue the delivery of coal to their buildings, and thereby be able to receive and deliver goods without any interference with coal teams.

5. Losses on account of smoke fines, or dirt in the building, due to operation of the boilers. In large western cities where soft coal is used, there has been an active campaign started to prevent the emission of smoke, and a number of these cities have laws imposing fines on the owners of smoky chimneys.

6. Losses on account of strikes, due to labor troubles.

If the above costs of operation are carefully tabulated and are based not on the theoretical economy of apparatus when operating at maximum load when new and under special conditions, but on the average operating economy as found in plants around town, they will show a substantial saving by the use of central station service providing the rates for central station service correspond with those recently made in many of our large cities. However, it is often easy to prepare figures which may appear theoretically correct, which give an entirely different result and perhaps show a saving by the use of an isolated plant. These figures fail to take account of the fact that where human agencies are employed there are always some mistakes being made and more or less waste from one cause or another.

Very few isolated plants can afford to purchase a high quality of talent in the operation of their machinery, and the result is that many things are continually going on in the engine room which militate to a great extent against economy of operation. The moment a plant is installed, no matter how well it is equipped, is the moment it starts to decay. If it is constantly oiled and kept in operation, it may appear to wear out, but there are various chemical causes of deterioration which are constantly at work, as, for example, oxygen forming rust, formation of scale by various deposits, and various changes in the substance of which the apparatus is made.

In other words, no matter how carefully a plant is installed, it is only a few months before a great many things require attention and repair. It is not profitable to keep up a plant to the high efficiency which it has when new. The plant owner would spend most of his time in making replacements.

In figuring the average cost of operating the plant, there are always losses to be figured, based on the average efficiency of a partially worn-out apparatus. The ordinary engineer in making up figures is apt to figure his coal on the theoretical B.T.U. contained in a pound of coal and he forgets the losses which come through poor coal occasionally delivered by coal companies, the loss caused by excessive moisture during rainy days in the winter time, and other losses caused by frozen coal. All these contingencies must be met from day to day in the operation of every power plant and these combined losses have a very important bearing on the general result at the end of the year.

In taking up the argument of central station versus isolated plant, the salesman should prepare himself especially on all the various factors, which enter into the heating problem. The engineer of a plant will always come back to his first plea, viz., "using exhaust steam for heating." In other words, he will claim that either the heat is secured for nothing or the electric lighting and power is secured for nothing in the winter time, due to the fact that he is using exhaust steam from his engines in heating the building.

HEATING BY EXHAUST STEAM.

Let us look a little more closely into the subject of heating by exhaust steam. It is not in all respects as satisfactory as has been represented. One of the first disadvantages met with is that oil is distributed all through the heating system, wherever exhaust from the engines has been used for a long time. To be sure oil separators can be used which will diminish this to a certain extent, but in nearly every combined heating and power plant there is found not only oil in the general heating system, but also the returns come back to the boilers with more or less oil, causing trouble in the boilers themselves. This, of course, occurs only where the steam passes first through an elevator pump or steam engine and the cylinder oil becomes mixed with the steam and circulates through the system. Where the boiler plant is operated for steam heating only, there is, of course, no occasion to use oil and the system remains intact.

Another disadvantage of the power plant as compared with the straight heating boiler is the high pressure it is necessary to carry in the boiler. It is not necessary to explain to any one that the higher the pressure in the boiler, the more danger there is of explosions and the various troubles to which boilers are subjected. The ordinary heating systems are usually operated at a moderate pressure with reducing valves at the various buildings to adjust the pressure to their requirements. Another disadvantage in the use of a power plant as opposed to the ordinary heating system is the excessive heat on the first floors and basement during the summer time. In the ordinary large building where steam is only required for heating and hot water service, it is simply necessary to operate a small water heater by means of hard coal or coke during the summer time. This requires about the same attention as the ordinary furnace in a private house.

An isolated plant requires boilers operated at high pressure all summer long, resulting in intense heat in the basement, which usually communicates itself to the offices and stores on the first floor. An advantage of central station heating service is the reliability on account of the large source of supply. Many buildings have simply a single small boiler to supply them with heat and if anything happens to this boiler, they are in trouble. When steam is sold on the meter basis, the consumer can turn the steam on and off as he needs it and pay for only what he uses. There is therefore a great tendency to eliminate waste of steam, whereas in many office buildings, operating a power plant of their own, steam is kept turned on whether it is needed or not and often when it is injurious to the occupants of the building.

In order to illustrate the method of analyzing the comparative costs of operation in a large city office building, the following are figures on a building recently analyzed in the city of Chicago. This building is a large office building about 200 ft. square and 21 stories in height.

It has a court in the center above the first floor 73 ft. square. The original estimate of the steam consumption based on the formulæ given in this book was 63,200,000 lbs. of steam. The actual consumption during the year 1913 as shown by meters was in round numbers 64,300,000, or about 1,100,000 lbs. over the estimate.

As the steam consumption in any building will vary ordinarily a much larger percentage from season to season, the estimate given may be considered fairly accurate. The original estimate for consumption of electricity was 1,250,000 K.W. hours. The consumption in 1913 was 1,100,000 K.W. hours. If a plant had been installed in the building, the consumption would probably have been about 50,000 K.W. hours more, and as the building is not quite rented, a complete rental of the building would probably bring the current consumption very nearly up to the estimate.

The actual consumption for this building was, in round numbers, 500,000 K.W. hours for tenants lighting, 150,000 K.W. hours for public lighting, and 450,000 K.W. hours for power, of which about three-quarters was consumed by the elevator equipment. Assuming a price for electricity of 2½c. per K.W. hour, from the central station service and a price of 40c. per thousand pounds for steam on central station service, it is very easy to figure the cost of central station service on this basis. Let us assume that the building will be fully rented and that the total consumption is 1,150,000 K.W. hours. We will also assume that the building purchases its entire requirements both for steam and electricity and retails the electricity to its own tenants. The total bills for the building would be:

1,150,000 K.W. hours at 2½c. per K.W. hour.....	$28,750.00
64,300,000 lbs. of steam at 40c. per thousand lbs.....	25,720.00
Total	$54,470.00

In figuring the cost of isolated plant service, it will be necessary to add the cost of electricity for lights in engine and boiler rooms, and also the cost of ventilating same. Assuming, therefore, that this amounts to 50,000 K.W. hours per year, the total electricity used by the plant would be 1,150,000 K.W. hours plus 50,000 K.W. hours, or 1,200,000 K.W. hours per year. The average steam consumption in office building plants as

shown by a number of tests taken on typical installations is about 60 lbs. of steam per K.W. hour throughout the year. While the above would represent average conditions, in this comparison it would be better to assume 50 lbs., since in a large building such as this it would be possible to get an economy above the average.

1,200,000 K.W. hours of electricity at 50 lbs. per K.W. hour would require 60,000,000 lbs. of steam per year. From the discussion and curves in the preceding chapter it would be fair to assume that about 40% of this would be saved for heating by utilizing the exhaust from the engines. This would leave a net steam consumption of 60% of 60,000,000, or 36,000,000 lbs. It has been shown by meter readings that the heating requirements of the buildings are 64,300,000 lbs. of steam. Adding together the steam required for electricity and the steam for heating, gives a total of 100,300,000 lbs., or in round numbers 100,000,000 lbs. of steam per annum. The average evaporation in this plant runs about 5 lbs. of steam per pound of coal. If a power plant were operated all summer long the average evaporation would be somewhat higher, say 5½ lbs. of steam per pound of coal. On the basis of 100,000,000 lbs. of steam, the annual coal consumption would be 18,181,818 lbs., or in round figures 9,000 tons. On this basis the operating expenses would be as follows:

Supplies.

9,000 tons of coal at $2.75 per ton		$24,750
Ash removal—6%		1,485
Water—for steam supply, washing out boiler and engine-room, etc.		1,000
Oil, waste and packing		1,200
Tools and miscellaneous supplies		1,200
Boiler and fire insurance		60
Total		$29,695

Labor.

Chief engineer	$3,000	
Assistant to chief engineer	1,500	
3 watch engineers	3,600	
2 oilers	1,920	
Engineer's clerk	480	
3 firemen at $840	2,520	
2 ashmen at $720	1,440	
Liability insurance and losses from sickness among employees	1,000	
Time of office, including manager's time for supervising.	1,000	
		$16,460
Total operating expenses		$46,155

In addition to the operating costs we must include the:

Fixed Charges.—To take care of this building, which has an aggregate installation of about 15,000 50-watt lamps, 200 H.P. in general power, and 600 H.P. in elevator power, or a total connected equipment of about 1,800 H.P., it will be necessary to install a plant of about 1,200 K.W., which would cost complete at $50 per K.W., about $60,000. The plant would also require space of upwards of 6,000 sq. ft. On the above basis, the fixed charges would be as follows:

Amortization at 3%	$1,800
Obsolescence at 5%	3,000
Interest at 6%	3,600
Repairs at 2%	1,200
Taxes at 1%	600
Rental value of space at 50c. per sq. ft.	3,000
Marginal charge for diversion of capital at 5%	3,000
Total	$16,200

Summarizing the above, we have:

Operating charges	$46,155
Fixed charges	16,200
Total	$62,355

It will be noted that the cost for labor to take care of the elevators, electric fans, etc., as well as the radiation, has been omitted from both estimates, as they are practically equal in both propositions. Comparing this with the above cost of central station operation, we find a saving of about $8,000 per year. As a matter of fact, the central station costs in Chicago are slightly under these figures. If the price for electricity, however, were 4c. per K.W. hour and the price of steam 50c. per thousand pounds, the situation would be reversed, and there would be a saving of about $16,000 in the operation of an isolated plant. In other words, the result is not determined by the cost of isolated plant operation, but by the rates offered by the central station company.

The above figures are given as average figures and may be found to be higher or lower in different localities and in different plants. The fact that some of the largest buildings in Chicago now operating plants are running at considerably higher expense than that assumed in this estimate tends to show that the estimated

cost of isolated plant service is conservative.

The above example is given merely as a guide to show the method of analyzing a given proposition and as an illustration of how accurately the consumption of a modern building can often be foretold by a careful study of the conditions beforehand. The estimates on consumption of electricity were checked at the time they were made by a comparison with the results in similar buildings. The estimates on steam consumption were based on the information given in the preceding articles. Inasmuch as any estimate of operation would be incomplete without including the cost of the heating service, it is impossible to make an intelligent study and analysis of the requirements of large buildings without thorough investigation and experience in the costs of heating these buildings.

The Difficulty of Measuring Heat

WITH SPECIAL REFERENCE TO RADIATED AND CONVECTED HEAT.

BY A. H. BARKER, B. SC. AND F. C. S. BRENDAL, B. SC.

(From a lecture delivered at University College, London.)

II

The essential principle of the thermopile is that when two conductors made of different metals are soldered together at their two ends and when those two ends are maintained at different temperatures, an electric current (which is very easy to measure exactly) will pass round the circuit whose magnitude is proportional for small differences of temperature to that difference. In order to multiply the effect, a number of these contacts are built up into a single fitting so that all the positive contacts face in the same direction. The surface formed by these contacts is exposed to the radiation whose intensity it is desired to measure, the other or negative contacts being not so exposed. The exposed surface thus absorbs the radiation which raises its temperature.

The current generated by the difference of temperature on the two sides of the thermopile is passed through a delicate galvonometer and is thus measured. The magnitude of the deflection in the galvonometer thus gives a measure of the intensity of the radiation.

It will be evident at once that this is a very indirect method of measuring radiation. How are we to know what the temperature effect of a given intensity of radiation on the thermopile will be? Primarily the current produced by the thermopile is merely a measure of the then existing difference of temperature between its two ends, and the law connecting the intensity of the radiation and the current given by the galvonometer is very difficult to determine. The difficulties may be briefly alluded to as follows:

Let us assume that the receiving surface of the thermopile is such that it converts the whole of the net radiation falling on it from the source into heat, i. e., that none is reflected. It is not by any means certain that it does so in fact. The effect of this heat communicated to the face of the thermopile is to raise its temperature. It is evident that some of the heat will be conducted away along the metal conductors of which the thermopile is composed to the back end. It would be a matter of practical impossibility to calculate what would be the rate of that flow of heat. Further, the ends of the thermopile in addition to being warmed by the radiant source are either warmed or cooled by contact with the surrounding air, more or less according as the ends are protected.

The question arises, does the difference in the temperature of the surrounding air make any difference to the reading of the thermopile, and if so, what dif-

ference? On the one hand every such difference would re-act similarly on the two sides of the thermopile if they were at the same temperature, but they are not.

If both ends of the thermopile are slightly cooler than the air, it is clear that the tendency of the contact of warm air will be to communicate more heat to the cooler end of the thermopile than to the warmer, and therefore to diminish the difference of temperature between the two ends, and so reduce the reading. If the thermopile is warmer than the air, the loss of heat will be greater from the warmer surface, which again tends to reduce the difference.

At first sight, therefore, one might suppose that a difference in the air temperature in the room would make little difference in the reading. In the experiments, however, we fear that a difference of room temperature does in fact make a difference in the reading.

On the other hand the thermopile can be, and is protected to a large extent from the effect of air currents by being totally enclosed, so far as is possible, and the amount of heat which is likely to be communicated to each face cannot be calculated.

RESULTS AFTER CALIBRATING THE INSTRUMENT.

It is evident that in order to obtain an accurate result, it is necessary to calibrate the thermopile experimentally throughout its whole range with the readings of the absolute instrument or radiometer and at different air temperature. We have made this comparison, though not so exhaustively as we intend to, and find that for this instrument and under the conditions in which we are working at a constant room temperature, the quantity of radiation is proportional to the 1.4th power of the current in the instrument. This, therefore, gives us the means of converting the galvanometer readings into B. T. U. per square foot by means of a series of factors differing according to the reading of the galvanometer and of the room temperature.

In previous experiments on this point the assumption has been tacitly made that the intensity of radiation is proportional merely to the reading of the galvanometer. This assumption is incorrect and must vitiate to a large extent previous results which have proceeded on this assumption.

It is possible that a more accurate method might be to maintain the cold junction at a constant temperature by enclosing it in a receptacle surrounded by melting ice or some other well-known method of maintaining a constant temperature. This would, however, involve that the air in the room should be kept constant in temperature, which is not an easy condition to carry out, especially when the whole of the result depends on the accuracy with which it is done. On the whole, from our experience we find it is better to take the reading without any artificial cooling of the negative junction.

It will be noted that it might be possible to obtain the convected energy in the case of an electrical radiator, especially by a process of subtraction. We know that the whole of the energy supplied is dissipated either by radiation or by convection currents. We know positively and accurately the total quantity of energy supplied to the apparatus. If then we measure with some approach to accuracy the total quantity of energy radiated, the difference between these two might be taken to be the quantity of convected energy. This, however, is an unsatisfactory method of going to work. It is much more convincing to measure positively the two quantities which go to make up the total and compare their sum with the measured total. A result of this kind gives us much more confidence in the accuracy of the results than the other method. This is a sort of book-keeping by double entry as against single entry.

EVEN GREATER DIFFICULTIES PRESENTED BY STEAM AND HOT WATER RADIATORS.

Mr. Barker went on to indicate how much more difficult were the problems presented by hot water or steam radiators and coal fires, which would form the subjects of future lectures.

An Organization to Classify Technical Literature.

Delegates from about twenty national technical and scientific societies met in the United Engineering Societies Building, New York, May 21, to perfect a permanent organization with the object of preparing a classification of the literature of applied science which might be generally accepted and adopted by such organizations. W. P. Cutter, librarian of the Engineering Societies Library and a delegate from the American Institute of Mining Engineers, read a paper on "The Classification of Applied Science," in which he outlined a plan whereby a central office could collate all the existing classifications and, with the help of specialists in the various national societies interested, compile a general system.

Permanent organization was effected by the election of the following officers: Chairman, Fred R. Low; secretary, W. P. Cutter. Executive Committee: Fred R. Low, W. P. Cutter, Edgar Marburg, H. W. Peck and Samuel Sheldon. It was agreed that a special invitation be sent to other national societies to participate by the appointment of delegates. The American Society of Heating and Ventilating Engineers was represented at the organization meeting by J. J. Blackmore.

Efforts will be made by the executive committee to enlarge the membership of the committee to include delegates from all similar national organizations and to prepare a plan for further action.

The name adopted for this organization is "Joint Committee on Classification of Technical Literature," and the temporary address of the secretary, W. P. Cutter, is 29 West 39th Street, New York.

Organization of New Industrial Board in New York State.

The new Industrial Commission, which was provided for in recently enacted legislation in New York State, to take over the work of the Workmen's Compensation Commission and that of the Commissioner of Labor, has been organized by Governor Whitman with the following members:

John Mitchell, chairman; James M. Lynch, formerly State Labor Commissioner; Louis Ward of Batavia; William H. H. Rogers, of Rochester, and Edward P. Lyon, of Brooklyn. Each of the commissioners will receive a salary of $8,000.

As announced last month, the new Industrial Commission does away with the industrial board of the Labor Department, which has had the power of making rulings regarding the heating and ventilation of factory buildings.

Architects Must Be Licensed in Illinois.

The Illinois law requiring architects practicing in that state to be licensed has been in effect 17 years, but few attempts have been made to enforce its provisions rigidly until the present board of examiners took office. The legality of the act has been established recently by the Supreme Court of Illinois and the board now proposes to enforce the provisions on its broad interpretation.

In the report of Francis M. Barton, secretary of the Board of Examiners of Architects of the State of Illinois, it is stated that there are at present 863 licensed architects, 410 architects who were admitted because they were practising when the law went into effect and 453 architects who passed examination by the board. While the board has agreed upon a broad interpretation of the wording of the law, it holds that only a licensed architect can practice in Illinois, or from the state, and that his license is not transferable or negotiable. There has been no Supreme Court decision on the matter until the present board assumed office and practically no court action of any importance that would give the board a precedent to follow.

The report states further that "this board has found its greatest work to be the elimination from the architectural field of various architectural firms which operate under an alias, such as architectural engineers, civil engineers, industrial engineers, designers, builders, etc. Most of these violations are assisted by a licensed architect who is either financially interested, a partner, or who secures a salary. The board has eliminated at least twenty such illegal combinations in the last few months and expects to eliminate all others from the architectural field in the near future. These combinations are to a great extent the result of lack of enforcement of the law or improper interpretations of the meaning of the wording of the act.

"Attention is called to the fact that all structural engineering on buildings is part of the architect's work and cannot be performed by others, except under the direction of a licensed architect; and that the architect is responsible for all engineering data on his sealed plans, whether performed by him or not."

The decision of the Supreme Court, which is referred to, was to the effect that the act is constitutional.

The next examination, it is announced, for the licensing of architects, will be held October 20, 21 and 22, 1915, at the University of Illinois, in Urbana.

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WITH the constantly increasing fund of technical matter that is being placed at the disposal of engineers, it is rapidly becoming a serious problem as to how this matter shall be made easily available for reference purposes. The problem applies not only to those who have had the opportunity of acquiring the data at the time of their publication, but also to the newcomers in the engineering field who find themselves almost literally swamped in a sea of technical literature which must be fairly bewildering to them. The fact is that only the few take the pains to collate the matter that directly applies to their line and, even then, they must of necessity at times overlook important contributions. Of course, indexing systems of various kinds have been proposed, many of which are now in use, but the difficulty is that they all lack, more or less, the feature of comprehensiveness.

It is evidently a realization of this condition that has prompted the movement, as noted on another page of this issue, to prepare a classification of the literature of applied science which could be generally accepted and adopted by the engineering world. It is stated that some twenty national technical and scientific societies were represented at the organization meeting for the furtherance of the plan and that the consensus of opinion was to the effect that such a classification, if properly prepared, might well serve as a basis for the filing of clippings, for cards in a card index and for printed indexes. It was further proposed that the publishers of technical periodicals might be induced to print against each important article the symbol of the appropriate class in this system. By clipping such articles a file could be made that would combine in one system these clippings, together with trade catalogues, maps, drawings, blue prints, photographs, pamphlets and letters, classified by the same system.

It is easy to see how such a system might in itself become cumbersome, but that is a separate problem that can be met by each profession for itself. The crying need just now is for the central index.

FOLLOWING are some of the ideas thrown out at the recent convention of the district heating engineers:

Boiler room efficiency can be increased in practically every power plant.

Powdered coal is the coming fuel.

Central station heating is the greatest undeveloped monopoly in this country.

Greater efficiency will place every unprofitable district heating plant on a paying basis.

Four fairly full-sized thoughts for one convention.

NATIONAL DISTRICT HEATING ASSOCIATION

Seventh Annual Convention, Chicago, June 1-3, 1915

From the standpoints of attendance, enthusiasm, character of the papers and reports presented, and outlook for the future, the seventh annual convention of the National District Heating Association, in Chicago, June 1-3, 1915, was a notable milestone in the growth of the central station heating industry.

A statement that possibly 50% of the companies supplying central station heat, if asked, would say that they were not making a profit, quickly brought forth the rejoiner that if this were true, it would only apply to those selling heat on a flat rate basis and that few meter rate companies could be found that were not making a success of the business. Incidentally it was brought out that about 80% of the district heating companies were still doing business on a flat rate, although the meter rate basis is now generally recognized as the only method, as far as steam heating service is concerned, that can be expected to give satisfactory results to both the company and the consumer.

D. S. BOYDEN, BOSTON, MASS.
President, National District Heating Association.

One speaker went even further and declared that if the companies showing no profit on the heating end of their business would submit their operating data to a competent committee, he felt assured that the leaks could be stopped and the business made profitable. He even went so far as to suggest the appointment of a "consulting staff" committee to take up these very matters. Since the companies are now obliged to make detailed reports to the public service commissions, the element of secrecy in plant operation would not be involved.

Enthusiastic applause greeted his statement that central station heating is today the greatest and most promising undeveloped monopoly in the country.

With a registration of 258 members and guests the prospect of a successful convention was assured at the outset. Among the most important matters that came up for discussion were the reports of the station operating committee and of the educational committee, which are summarized in another column.

Two of the keynotes of the convention were struck when a speaker declared that the crying need of power plants today is greater efficiency in the boiler room, and that the use of powdered coal for fuel is shortly to become standard practice.

A special word should be said regarding the exhibit hall, which contained one of the most attractive displays of district heating apparatus and appliances shown

at any convention. The fact that passage to the meeting room was through the exhibition hall was a happy arrangement that contributed much to the success of the convention.

First Session, Tuesday Morning.

The opening session was called to order by President H. R. Wetherell at the Hotel Sherman. Harry Muller, prosecuting attorney of Chicago, welcomed the delegates to Chicago on behalf of Mayor Thompson. His address of welcome was acknowledged by David S. Boyden. President H. R. Wetherell then presented his address:

PRESIDENT'S ADDRESS.

"No doubt, if you were to make a canvass of all the heating companies in operation at the present time as to whether they were operating on a paying basis, 50% of them would tell you that they were not. If you were to ask these companies how many feet of mains and services they had installed, how much steam they sent out per square foot of radiation connected, what their line loss amounted to per square foot of surface in mains and services, and how much revenue they were receiving per square foot of radiation and per 1,000 lbs. of condensation, they probably could not tell you. You would also find that there was no one person in direct charge of the heating department or that the electric or gas superintendent or some other official, whose time was all taken up looking after his own department, was taking care of the steam department as a side issue.

"Gentlemen, I believe the day has come when we should not look on the steam heating as a by-product of the electric, which should be given away at cost or at a loss to secure the electric business. I believe that with the use of the modern heating systems and the proper attention and engineering that steam can be sold by meter rate at a cost which will be attractive to the customer and also pay a good revenue to the heating company.

"The coming of the public service commission is also a good thing for the district heating company. The ruling of the public service commission requires the district heating company to sell steam for their published rates only, which eliminates the old practice of making special rates and giving steam service at a very low cost in order to secure the electric business. Contracts of this sort are a great many times the cause for the heating department being operated at a loss.

"If you were to make an investigation of all of the companies who are losing money on their heating departments you would find in 90% of these companies that it was not the cost of the operation that was excessive, but that they were not receiving enough revenue for the service they were delivering. If you were to place several meters on some of the heating systems which were operating under a flat rate you would find that they were using from two to three times as much steam as they were paying for, basing the charge for the metered steam at a rate which would pay you a fair profit above your operating expense.

"If you were to put these same customers on a meter rate and teach them how to regulate their service they would cut their consumption to the point where their season's charge would be as low, if not lower, than they had paid you under the flat rate system and you would be making money on this service. You would also have the amount of steam that they had originally wasted to sell to some other customers, which it was impossible to connect to your lines with the old arrangement for lack of capacity.

"The day has also come when the public service company should co-operate with the customer and break away from the old method of keeping the customer in the dark. By this I mean that we should not hesitate to show them our records and let them know what the other fellow is paying. We should also show the customer every possible means of regulation in order that he may cut his bill to the minimum. If you are operating under a sliding scale of rates, the lower the customer's consumption the company will receive a higher rate per 1,000 lbs. of steam. This is particularly true when you are operating under a guaranteed maximum charge.

"I know of several companies who read their steam meters four times a month and the pounds of steam consumed per square foot of radiation connected in each building is computed. If it is found that the customer is using more steam than he should for his particular class of business a man is sent out by the heating company to inspect the meter and to take morning and evening readings each day for several days to see if the customer is shutting his service valve at night and to find just what regulation the customer is giving to his heating system. When this information is secured a postal card is sent to the customer showing the reading of the meter for the beginning and end of the last period, the amount of steam consumed during period, the amount consumed per day, the cost of heating for period, the cost of heating per day and the amount it should cost them per day with good regulation. There are also suggestions placed on the card as to how the customer could effect the saving with better regulation.

"Information of this kind has created a very good feeling of the customers toward the companies who are using these methods. That is only one suggestion as to the little things which could be done by the public service companies at very little cost to them, which, in the long run, would benefit both parties.

"There is one other point which I wish to bring out while I am on this subject, and that is the importance of the condition, the kind and the construction of the customers' heating system. I have probably harped on this subject too much in the past, but I have always thought, and still think, that the interior piping in the customers' buildings has more to do with the success of the district heating company than any other one thing. As one example of this, I wish to give you some data on one building which shows this fact up very plainly. The customer in question operates a nine-story department store, a four-story warehouse and a two-story garage. They are operating under a very low flat rate contract, which does not expire until about the year 1921, and in which there is a clause stating that any radiation which is added in new buildings or additions to the old ones during the period of the contract will be taken at the same unit price per square foot of radiation. Two seasons ago this customer built a nine-story addition to the department store, and the heating company insisted that an atmospheric system of heating be installed in same.

"During the fall of 1913, while the building was in course of construction, the steam was supplied to same by meter rate. The customer moved into the new addition about December 1st of that year, and at the end of January the heating company discovered that if the customer kept up the same regulation of the heat for the entire season that they had the first few months they would run less than their flat rate. The customer was notified to that effect and signed meter rate for that part of the building for the remainder of the season and stated that if they ran less than their flat rate they would continue on the meter rate in the future. They ran $226.84 less from November 11th to the close of the season than they would have paid flat rate for the same period, which nets a saving of about 13% below the flat rate. They are now regulating the service in their old building to see if it is possible to beat their flat rate there also. I might also state that last season is the first season that the heating company has made a profit on the steam sold to this customer, as they, like all flat-rate customers who have the old one-pipe system installed in their building, use twice as much steam as they pay for."

SECRETARY-TREASURER'S REPORT.

Secretary-Treasurer D. L. Gaskill reported total receipts for the year of $3,408.60, which, with the balance at the beginning of the year, made a total of $4,381. The year's expenditures were $3,328.31, leaving a balance on hand of $1,052.69. The financial affairs of the society, the report stated, have never been in such satisfactory condition. The membership has been increased from 300 to 344.

Secretary-Treasurer Gaskill recommended the election of honorary membership of men whose achievements in the line of heating have been such as

to make them national or international in their reputation, especially such men who are so situated that they would not be eligible to regular membership in the association.

He also spoke of the increased number of inquiries from foreign countries for membership, showing the spread of the district heating idea in Europe.

Regarding the organization of the membership committee, the secretary expressed the opinion that the plan followed in past years of appointing a committeeman from each State was not a good one, and recommended that a committee of seven or nine members, selected particularly for their fitness and location, would accomplish more.

Still another recommendation of Secretary-Treasurer Gaskill was that the retiring presidents should be presented with some fitting memorial or emblem as an appreciation of their services.

The auditing committee, composed of D. S. Boyden and George S. Martin, reported the books in good condition and the accounts correct.

Secretary-Treasurer D. L. Gaskill then read a postal card from August Beaurrienne, a member of the association, now serving in the French army, announcing his inability to attend the convention. On motion, it was voted to send the greetings of the association to M. Beaurrienne.

The report of the executive committee contained the names of some sixty applicants who were elected to membership.

President A. H. Wetherell announced the appointment of a nominating committee, consisting of E. L. Wilder, chairman, Rochester, N. Y.; Fred B. Orr, Chicago, and C. H. Spiehlman, Dayton.

REPORT OF STATION RECORD COMMITTEE.

This concluded the preliminary business and the technical part of the session was then opened with the presentation of the Report of the Station Record Committee, by A. Biggs, of the Edison Illuminating Co., Detroit, Mich., chairman.

One of the features of the report was a list of "ten commandments" for the operation of a central heating station, as follows:

1. I am thy indeterminate heating franchise, given thee for the good of the city and only incidentally for thy gain.

2. Thou shalt not raise any monument to inefficiency in thy works, nor do any work without the city permit, nor let thy plant or thy system break down so that the city's children be deprived of warmth, neither shalt thou shut steam off early from the mains at the ends of winter, even for the saving of thy coal pile.

3. Thou shalt not violate the terms of thy franchise, for thy franchise is revokable upon thy bad behavior.

4. Remember the rainy days to keep a fund for them. In all the days that thou shalt labor and do all thy work, thou shalt be diligent that thy excavations be quickly closed, that thy dirt piles be in order and soon removed, and that the ditches by the roadside be unobstructed.

5. Honor the ordinances of thy city, and thy agreements made when I was written, that thy days may be long in this town which thy franchise has handed unto thee.

6. Thou shalt not drown thy customers with wet steam.

7. Thou shalt not have questionable alliance with other companies, or with the officials of the city.

8. Thou shalt not cease to barricade thy trenches in the public highway by day, nor to indicate them by lighted lanterns by night, nor shalt thou fail to save thy city from damages when any person stumbleth by thy works.

9. Thou shalt not carry soot from smoking chimneys upon thy neighbor's clothes line.

10. Thou shalt not covet thy customer's pocket-book, thy meters shall register within four per centum, they shall not spin and neither shall they stop altogether, lest they unduly increase some one's else proportion of thy operating expense.

The work of the record committee resulted in the collection of some 25 copies of franchises under which member companies are operating. The report was accompanied by a large table containing an analysis of nineteen different heating franchises showing their variations. These features were discussed in the re-

port in detail. An appendix contained considerable data on steam consumption in various buildings; also tables on cost of trenching operations.

Second Session, Tuesday Afternoon.

The afternoon session was opened with an address by J. F. Gilchrist, vice-president of the Commonwealth Edison Co., of Chicago, in which he traced the growth of the heating business in connection with the electric lighting business, which resulted, in his company, in the formation of the Illinois Maintenance Co., which was organized to operate existing plants in large buildings in Chicago. Mr. Gilchrist emphasized the point that the way to secure economy is to concentrate production, and that this applies to the economical burning of fuel, the economical purchase of fuel and the labor economy. He also spoke of the advantage of reducing the smoke nuisance and fire hazard. Economies were also to be obtained in the handling of fuel and ashes, while the difference in traffic is noticeable. Mr. Gilchrist presented some interesting coal figures showing that out of the 517,453,000 tons of coal burned per year in the United States, the central lighting stations used 17,375,000 tons; the street and electric railway systems used 10,078,000 tons; the steam railways, 100,000,000 tons; and all other users, 390,000,000 tons.

He stated that the comparatively small amount of coal consumed by the electric lighting and electric railway systems was all out of proportion to the amount of work done, showing the economies now being effected by them.

He also urged that the users of steam heating should be educated, and instanced the case where a district heating plant was in danger of being closed on account of lack of profits. When the matter was put squarely before the community there was no difficulty in securing rates sufficiently high to give a reasonable profit.

Mr. Gilchrist said that only the large individual producers of electric energy in their plants are holding out against the use of central station heat. He said we were just beginning to appreciate the wonderful possibilities of the business.

MODEL HEATING FRANCHISE PROPOSED.

Following Mr. Gilchrist's address the discussion was opened on the report of the station record committee.

Charles R. Bishop suggested the compilation of a model heating franchise. This idea was received with favor and, on the suggestion of Secretary Gaskill, the matter will be taken up by the Public Policy Committee and made the subject of part of its report next year.

REPORT OF PUBLIC POLICY COMMITTEE.

The report of the Public Policy Committee was then presented by D. L. Gaskill, chairman. Among the subjects discussed in the report were: Education of the public as to the cost and advantages of heating service; extension; appraisals; rates; municipal ownership; legislation and franchises. The report took a positive stand against municipal ownership. It was also declared that utility legislation is in its infancy and is illy adapted to the needs of the public and the utilities it affects.

Regarding the effects of municipal ownership, Mr. Gaskill mentioned specifically the operation of the city heating plant in Cleveland as showing the difficulty to make such plants profitable, this plant having shown a loss each year since its installation.

Mr. Wilder called attention to another risk that lighting and heating companies are now experiencing in connection with the introduction of the jitney bus, which, he said, was responsible, in many cases, for the poor showings of such companies.

NEW OFFICERS.

At this point the report of the nominating committee was presented, the entire ticket being elected at a later session, as follows:

President, David S. Boyden, Boston, Mass.

First vice-president, Byron T. Gifford, Grand Rapids, Mich.

Second vice-president, George W. Martin, New York.

Third vice-president, William S. Monroe, Chicago, Ill.

Secretary-treasurer, D. L. Gaskill, Greenville, O.

Members of executive committee: C.

F. Oehlman, Denver, Colo., and Thomas Donahue, Lafayette, Ind.

Third Session, Wednesday Morning.

Following the election of a number of associate members, the report of the Committee on Underground Construction was presented by H. A. Woodworth, chairman, of the Merchants' Heat and Light Co., Indianapolis, Ind.

This report proved one of the most interesting and valuable of the meeting. It was considerably broader than its title indicated, being a review of present practice in the selection of materials, installation and operation of district heating mains. A circular letter was sent by the committee to various companies affiliated with the association, asking for particular data. The replies showed that there was a wide variation in the methods used throughout the country, but a study of the data indicates that the variations are not due to geographical location or climatic conditions. This variation, says the report, illuminates the fact that the greatest need of the industry is closer attention to standardization.

The report proceeded to discuss each item and to present a suggestion for standard practice. A number of valuable charts were included, one being a graphical solution of the Unwin formula for the pressure drop in steam pipes. The condensation loss in underground pipe lines was treated at length, the data including a number of tests which agreed fairly closely with the losses usually figured.

A subdivision of the report was a discussion of "Evaluation of Heating Utilities in Indiana" by H. O. Garman, chief engineer of the Indiana Public Service Commission.

The committee expressed the opinion that the field of district heating is barely touched. It recommended that future committees strive to standardize underground construction.

The remainder of the report was devoted to descriptions of various types of underground pipe conduit now on the market, which were illustrated in each case.

In discussing the report A. C. Rogers referred to the committee's statement that the heat losses from underground pipes were greater in summer than in winter, and expressed the opinion that higher velocities would reduce these losses and accomplish practically the same results.

Byron T. Gifford stated that the greater amount of exhaust steam available in the summer time might account for the higher losses, due to the moisture in the steam.

George W. Martin confirmed the statement as to greater line losses in summer which, he said, was the condition observed in the pipe line tests conducted at the Hall of Records, New York, by Reginald Pelham Bolton.

Mr. Nutting, in discussing the report, proposed the appointment of a committee to study the actual cost of manufacturing steam.

The next paper was on "Operating Experience with Bleeder Type Turbines," by F. W. Laas, chief engineer for the Iowa Railway & Light Co., Cedar Rapids, Ia. In the discussion several of the members, including Mr. De Wolf, Nutting and Shaw, gave the results of their own experiences with bleeder turbines, Mr. Shaw giving a number of instances of the successful use of this type, especially in hot water heating work.

Fourth Session, Wednesday Afternoon.

The report of the Educational Committee was the first business of the Wednesday afternoon session, and was presented by David S. Boyden, chairman. The divisions included "The Establishment of a Standard for Transmission Losses from Buildings of all Constructions," by Reginald Pelham Bolton; "The Establishment of Standard Methods of Proportioning Direct Radiation and Standard Sizes of Steam and Return Mains," by James A. Donnelly; "The Establishment of a Standard Coefficient for Heat Losses Effected by Wind Movement," by H. W. Whitten and R. C. March; and, finally, "The Establishment of Standard Heating Elements for Cooking Apparatus, with Special Reference to Low Pressure Heating," by D. S. Boyden.

The data contributed by Mr. Donnelly included proportionate requirements for other than the usual conditions, with reference to such items as radiator trans-

CONVENTION DINNER OF THE NATIONAL DISTRICT HEATING ASSOCIATION, HOTEL SHERMAN, CHICAGO, JUNE 2, 1915.

mission, amounts of radiation required and heat losses from buildings.

It is the intention of the committee to co-operate with a similar committee of the heating engineers' society in further developing the data obtained.

In discussing one matter brought out by Mr. Donnelly referring to the varying of the heat transmission factor for varying temperature differences, E. A. May stated that the experience of the Institute of Thermal Research of the American Radiator Company was that this coefficient did not vary as much as 2 per cent, as stated by Mr. Donnelly.

Mr. May presented some interesting figures bearing on radiator transmission. With an unpainted 38-in. radiator placed against the outside wall the coefficient was found to be 1.72. When a sheet of asbestos was placed between the radiator and the wall, the coefficient fell to 1.66. The radiator was then painted with aluminum bronze, and with the insulation taken away, the coefficient was 1.46, and with the insulation replaced, the figure became 1.42. Afterwards the same radiator was painted with a maroon japan and the coefficient jumped up to 1.7, without the insulation, and to 1.65 with the insulation.

Mr. May argued from these results that we are not yet prepared to decide on a standard transmission factor for radiators.

The section of the report devoted to cooking apparatus also brought out an extended discussion, and it was shown that this was a promising field of work for the central station heating man and that the manufacturers of such apparatus had little if any data regarding the operation of these appliances. It was brought out that the development of cooking apparatus suitable for use with low-pressure steam of 10 lbs. or less has already been accomplished on the Pacific Coast in spite of a manufacturer's statement that "it can't be done."

A paper was then presented on the "Commercial End of the Heating Business," by C. F. Oehlman, of the Denver Gas & Electric Co. A statement in this paper that "the heating department will in no way be responsible for the proper operation of a system brought forth some remarks from C. A. Gillham, who cited a number of experiences of the New York Steam Company showing improper installations which were the cause of complaints by the consumers on their heat bills which the company remedied to the advantage of all concerned. He strongly advocated the practice by heating companies of supervising the installation and operation of the plants. Mr. Gillham's experience was borne out by President Wetherell, who stated that in Peoria, Ill., the heating company made it a practice to design the plants to which its service was connected.

President Wetherell then called for a vote on the report of the Nominating Committee, and the nominees were elected unanimously. President-elect D. S. Boyden was called on for a speech, to which he responded by pledging his efforts to a continuation of the association's successful career. First Vice-President-Elect Byron T. Gifford also spoke, expressing his appreciation of the honor conferred, and his deep interest in the association's welfare.

Fifth Session, Thursday Morning.

Thursday morning's session was opened with the reading of a paper by W. G. Carlton, engineer, on "The Hot Water Heating System at the Grand Central Terminal." The paper was a condensed description of this extensive plant which supplies buildings having a total capacity of 50,000,000 cu. ft.

The method described for measuring the heat supplied through the use of Venturi tubes, in conjunction with recording thermometers, brought out a discussion as to whether this method could be generally applied in central station hot water heating work. Mr. Carlton stated that the smallest customer on the Terminal plant had 12,000 sq. ft. of radiating surface. He expressed the opinion that this method would be prohibitive in cost of operation if applied to small consumers.

Another question as to why hot water was chosen as the heating medium in the Terminal was answered by Mr. Carlton, who said that the possibility of breaks in steam mains where railroad tracks were located, which might result in clouds of

vapor, made it advisable to choose the hot water system.

In the ensuing discussion, Joseph Harrington, a boiler room expert, declared thant 70% of boiler plant operation can be improved upon from the standpoint of increased efficiency. Combustion efficiency, he added, is being rapidly reduced to an exact science. Among the principal agencies for improving boiler plant operation, he mentioned water softening, water purification, the use of recording instruments and daily reports.

Mr. Harrington said the practice of five or ten years ago was not the criterion of present-day practice. In this connection he mentioned the possibilities in the use of powdered coal for fuel, which, he said, was a coming practice within a comparatively short time.

Mr. Higgins also emphasized the possibilities of powdered coal and reviewed present practice in its manufacture and use.

J. G. De Remer, discussing the report in a general way, declared that district heating is the greatest undeveloped monopoly and, referring to a statement that many of the central heating companies were not making a profit, he expressed the opinion that if the data of these plants could be analyzed by a suitable committee, the companies could be placed on a profitable basis.

He urged the association to appoint a committee to take up such matters.

The fallacy of secret operation of heating plants, he said, has been eliminated, largely due to the publicity as to records required by the public service commissions. He suggested the name of such a committee to be the "consulting staff" committee. Mr. De Remer also urged the district heating companies to appoint "heating solicitors" to get after prospective customers.

Sixth Session, Thursday Afternoon.

Owing to the lateness of the hour the discussion of station operating committee's report was carried over to the afternoon session, when it was further discussed by Messrs. Nutting, Vater and Gifford.

A paper was then presented by C. C. Wilcox, engineer for the Hodenpyl Hardy Co., Jackson, Mich., on "A Pressure Survey Study Constituting a Report on the Comparative Use of Exhaust and Live Steam for Heating." The paper described a series of experiments carried on by the Central Illinois Light Co., near Peoria. The tests, which were given in considerable detail, indicate that if a like amount of heating is accomplished, it requires no more live steam than exhaust steam to do it; in fact the indications are just the reverse.

This paper opened the general subject of the comparative heating value of live and exhaust steam. George W. Martin, of the New York Service Co., was down on the programme for a paper on "Exhaust Steam vs. Live Steam for Heating," which he contributed as part of the discussion. Among others who participated were C. R. Bishop, D. S. Boyden, J. G. De Remer and Messrs. Nutting and Meyer.

All of the familiar instances were cited pro and con, and the subject was finally disposed of by referring it to a committee consisting of Messrs. George W. Martin, J. G. De Remer, C. C. Wilcox and Hobbs.

Before the meeting closed a motion was adopted, authorizing the executive committee to establish an association bulletin, to be published quarterly.

Following the passage of resolutions of thanks to the retiring president and committees and to the management of the Sherman Hotel, to the entertainment committee and to the exhibiting manufacturers, the meeting came to final adjournment.

THE EXHIBITS.

The most elaborate exhibition ever seen in connection with a convention of the National District Heating Association was held in the Louis XVI room, immediately adjoining the convention hall. About twenty manufacturers were represented by displays.

To add to the attractiveness of the scene the booths were partitioned off with hollow steel tubing, decorated with ropes of white chenille, while the signs of the exhibitors were of a uniform style of mahogany effect. Located at different points along the tubing were shields in the form of keystones bearing the emblem of the National District Heating Association in gold tinsel. The

arrangement of the booths was made by the National Exhibit Bureau, of Chicago.

Consolidated Engineering Co., of Chicago, had an elaborate display of an electrically-operated fractional valve connected to a glass radiator showing the method of controlling the steam supply to the radiator. There was also an electric-driven boiler feed pump in operation. The company's line of steam specialties used in connection with the Van Auken vacuum heating system and the Thermograde modulation heating system were also shown. The company's representatives present were B. Van Auken, president; John F. Hale, vice-president and general manager; H. Tyler Kay, advertising manager; and A. H. Probst, superintendent of installation.

Westinghouse Electric & Mfg. Co., Pittsburgh, Pa., had an exhibit of photographs showing different types of generating units, including straight condensing, non-condensing, bleeder type and geared units; also surface and jet condensing equipments, including a 30,000 k. w. surface condenser and a 25,000 k. w. jet condenser. L. S. Shaw represented the company.

Detroit Lubricator Co., Detroit, Mich., showed various types of the Detroit packless radiator valve and the Detroit multiport valve, including globe, gate, angle and corner valves. R. H. Lindman was in charge.

National Air Cell Covering Co., Brooklyn, N. Y., had a full-size standard double thick section of Pyro-Bestos underground pipe covering, with underdrain of glazed tile which acts as both drain and support. The equipment also included a ball-bearing pipe guide. Sections of single and double thick Pyro-Bestos pipe covering were also shown, in addition to a sample of Pyro-Bestos cement. G. Clarence Hall had charge of the exhibit.

American District Steam Co., No. Tonawanda, N. Y., showed a model of its underground pipe casing and also a sectional model of the company's multi-cell underground pipe construction. The exhibit also included its line of underground fittings, and Adsco steam specialties for the Atmospheric system of heating. The company's delegation consisted of W. H. Wells, president; C. R. Bishop, general manager; and H. C. Kimbrough, H. A. Austin, R. C. Holly, J. G. De Remer, Lloyd Howell and C. A. Dudley.

J. C. Hornung, Engineer, Chicago, showed types of his pressure and temperature controlling valve for steam, a broken model of his differential and temperature control valve for hot water; also the B. C. condensation trap, the central station special expansion joint, tank regulator, and his all-asbestos broken-jointed method of underground pipe conduit and insulation for steam and hot water. Those on hand in the interest of this exhibit were J. C. Hornung, D. T. Wallace and A. E. Schad.

Jenkins Bros., New York, had a display of its line of valves and packings, including the impulse valves and differential valves used in the Positive Differential system of steam heating. H. B. McLelland was in charge of the exhibit.

Tyler Underground Heating Systems, Pittsburgh, Pa., had a well-planned exhibit, consisting of a model of the Tyler multiple tunnel construction, including brackets, angles and expansion joints; also a sample of the one-pipe ditch construction, including anchors, expansion joints, casing, and pipe supports laid in concrete and arranged so that the pipe could be rotated. There were also Tyler condensation meters of 400 and 1,800 lbs. capacity per hour, and Tyler single and double expansion joints. The company's delegation consisted of E. B. Tyler, George A. Schmidt, Walter K. Long, M. E. Hathaway, J. S. Ward, and John E. Lord.

Republic Flow Meters Co., Chicago, had a recording steam meter in operation connected to the laundry on the thirteenth floor of the hotel. The company displayed types of its steam, water, air and gas meters, single tube manometers, long-distance pressure recorders and indicators; also indicating air and gas meters and the Spitzglass slide rule. The company was represented by J. D. Cunningham, John Norwornik, J. M. Spitzglass and A. Henderson.

V. D. Anderson Co., Cleveland, O., showed sectional models of the model D steam trap, steam and oil separator, high and low water column, alarm water column, oil filter and air trap. Charles H. Fiske and Leslie B. Fiske had charge of the exhibit.

Boylston Steam Specialty Co., Chicago, Ill., showed broken full-sized models of its line of steam traps, pressure regulators, vacuum governors, and pilot valves. John Boylston, Sr., John Boylston, Jr., and H. J. Richter looked after the company's interests.

Central Station Steam Co., Detroit, Mich., had a Detroit condensation meter in operation, with a capacity of 450 lbs. of condensation per hour, or large enough to take care of 1,500 sq. ft. of direct radiation. The company's exhibit also included a section of a diaphragm type expansion joint 4 in. in diameter. Those on hand for the company

were J. V. Redfield, president and general manager; W. R. Owen and F. A. Green.

Illinois Engineering Co., Chicago, Ill., had on exhibition types of its graduated radiator supply valves and thermo return valves and float return traps; also pump and pipe strainers and oil separators. The company was represented by J. C. Matchett, R. L. Gifford and F. Van Inwagen.

American Radiator Co., Chicago, Ill., showed a working model of its regitherm in connection with a Sylphon reducing valve, for central station heating work. This appliance attracted much interest on account of the fact that no auxiliaries are used in its operation. The exhibit also included samples of Sylphon packless valves. Those representing the company were C. J. Swan, F. C. Reeder and A. K. Root. E. A. May, the company's boiler expert, was also present in his capacity as a member of the heating engineers' committee which was appointed to confer with the educational committee of the National District Heating Association. J. H. Davis was also present.

Michigan Pipe Co., Bay City, Mich., showed different sizes of the Michigan tin-lined underground wood pipe covering, with shells of 2 in., 3 in. and 4 in. in thickness. Harry B. Smith, Jr., had charge of the company's interests.

G. M. Davis Regulator Co., Chicago, were among the exhibitors, displaying aluminum sectional models of the Davis Class C non-return valve, pressure regulator, balance valve, float valve, damper regulator, noiseless back pressure valve, relief valves for condensing engines, continuous flow steam trap, and automatic choke valve for diverting flow of water in central heating plants.

Armstrong Cork & Insulation Co., Pittsburgh, Pa., had on exhibition samples of Nonpareil high-pressure steam pipe covering and of Nonpareil heat insulating brick. There was also a model of a boiler setting insulated with one course of 4½-in. insulating brick, and a section of underground steam line construction, with split-tile protection, the Nonpareil pipe covering being supported by pipe rollers. Those present for the company included W. A. Speelman, E. N. Heidkamp, G. G. Oetting and H. E. Moon.

A. Wyckoff & Sons Co., Elmira, N. Y., had an exhibit showing the old and new 8-in. construction of its wood steam pipe covering. E. M. Peter and Emory E. Peter were in charge.

H. W. Johns-Manville Co., New York, exhibited a full-size model of the J.-M. underground sectional pipe conduit, together with many of its electrical specialties, including electrical fibre conduit for running electric wires underground, the Noark line of fuses and boxes; also pipe insulation and packing. Those on hand for the company were H. W. Frantz, George Becker and H. F. Newell.

Cannelton Sewer Pipe Co., Cannelton, Ind., showed two models of the Cannelton method of insulating and supporting underground steam and hot water lines. One of the models showed the offset tee used with this type of construction. The company was represented by C. A. Clemens.

The Entertainment.

An entertainment program, remarkable for the completeness of its details, was carried out by a committee consisting of Harold Almert, chairman: Fred B. Orr, L. S. Shaw, Oliver H. Hogue, George H. Jones, John G. Learned, J. L. Hecht, H. S. Hart, Charles H. Fiske and H. B. Braydon.

On Tuesday afternoon the ladies were entertained at a musical and card party at the Hotel Sherman. In the evening the members and guests took in the show at the Majestic Theatre.

Wednesday morning was devoted to a shopping tour for the ladies and in the afternoon they were taken in automobiles for a ride about the city and thence to the Midway Gardens where they were entertained with some clever dancing by professional talent.

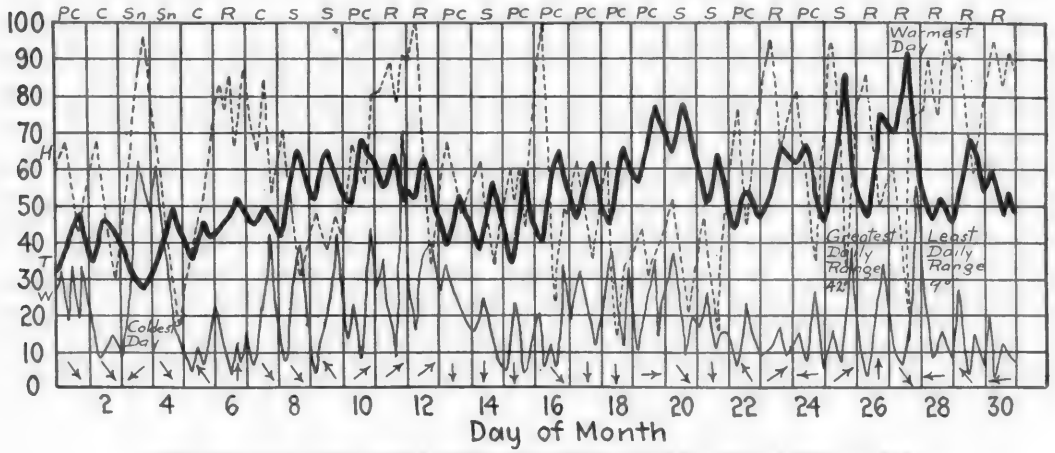
Wednesday evening was devoted to the convention dinner and dance at the Hotel Sherman. Every detail had been carefully worked out under the immediate direction of L. S. Shaw. During the dinner itself a male quartette and two young lady singers entertained the company. Later the guests adjourned to the exhibition hall while the dining hall was cleared for dancing. As they passed into the exhibition hall they were invited to witness the feats of a sleight-of-hand artist who proved himself well worthy of the name.

By this time the ballroom was ready for business and the remainder of the evening was spent most enjoyably with both old and modern dances, interspersed with exhibition dancing by professionals. The entire affair was so admirably planned and carried out that the company was enthusiastic in its appreciation and approval.

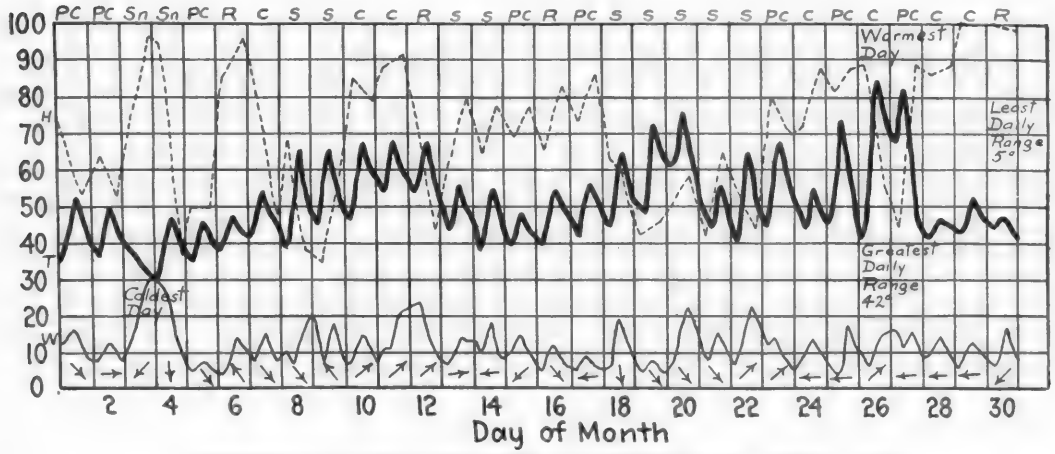
Thursday morning was spent by the ladies in visiting some of Chicago's big stores and in the afternoon they were taken for an excursion on Lake Michigan on board the U. S. Training Ship, Isle de la Luzon. A buffet luncheon was served on board.

The Weather for April, 1915.

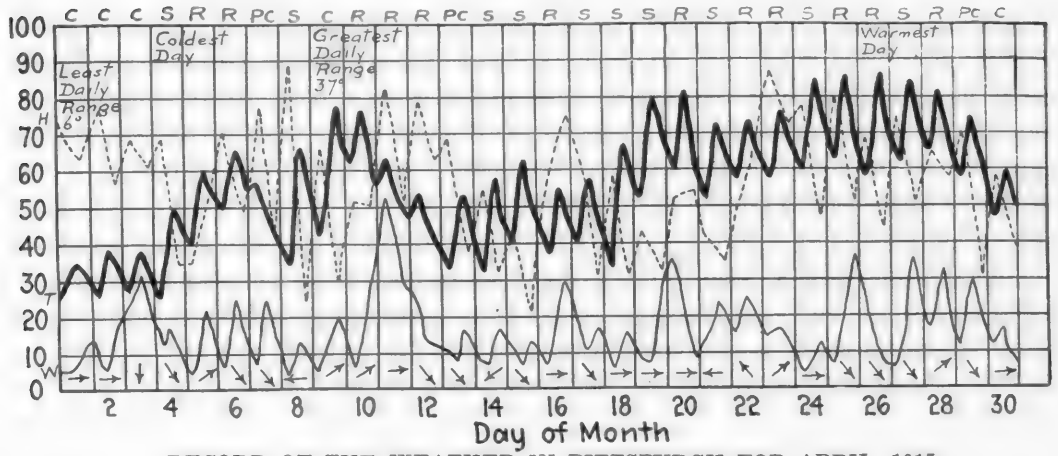
	New York	Boston	Pittsburg	Chicago	St. Louis
Highest temperature, degrees F.	91	84	87	88	86
Date of highest temperature	27	26	26	26	27
Lowest temperature, degrees F.	28	30	26	30	30
Date of lowest temperature	3	3	4	4	3
Greatest daily range, degrees F.	42	42	37	28	26
Date of greatest daily range	25	26	9	20	7
Lowest daily range, degrees F.	9	5	6	4	8
Date of least daily range	28	30	1	3	1
Mean temp. for month, degrees F.	53.4	51	56	56	63.2
Normal mean temp. for month, degrees F.	48	45.3	51	45.9	56.1
Total rainfall, inches	2.1	1.86	1.27	1.02	1.2
Total snowfall, inches	10.2	6.1	..	..	..
Normal precipitation, this month, in.	3.3	3.55	2.9	2.88	3.52
Total wind movement, miles	11959	7699	7718	8582	9782
Average hourly wind velocity, miles	16.6	10.7	10.7	11.9	13.6
Prevailing direction of wind	N.W.	N.W.	N.W.	S.	S.
Number of clear days	7	10	10	15	18
Number of partly cloudy days	14	8	6	10	8
Number of cloudy days	9	12	14	5	4
Number of days on which rain fell	12	6	12	9	8
Number of days on which snow fell	2	2	..	..	..
Snow on ground at end of month	..	..	..	..	..



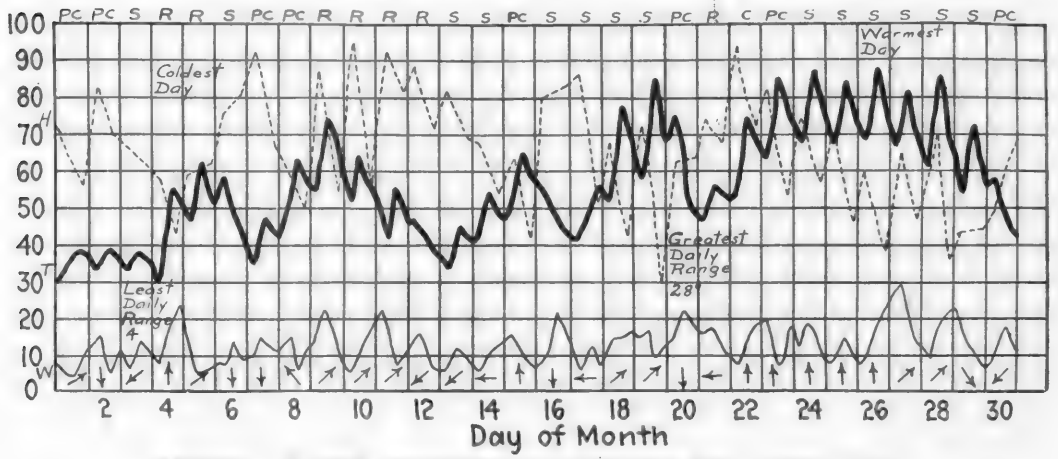
RECORD OF THE WEATHER IN NEW YORK FOR APRIL, 1915.
(Relative Humidity Curve is Plotted from Hourly Observations.)



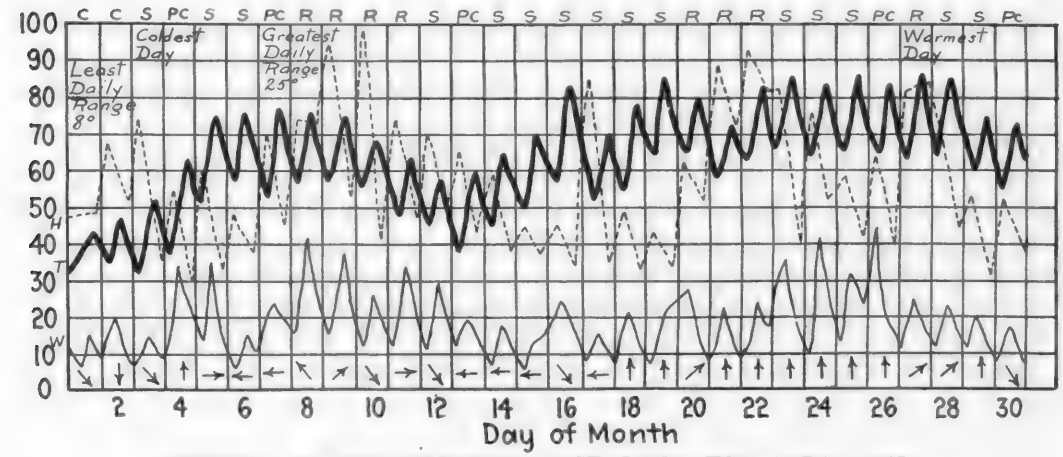
RECORD OF THE WEATHER IN BOSTON FOR APRIL, 1915.



RECORD OF THE WEATHER IN PITTSBURGH FOR APRIL, 1915.



RECORD OF THE WEATHER IN CHICAGO FOR APRIL, 1915.



RECORD OF THE WEATHER IN ST. LOUIS FOR APRIL, 1915.

Plotted from records especially compiled for THE HEATING AND VENTILATING MAGAZINE, by the United States Weather Bureau.
Heavy lines indicate temperature in degrees F.
Light lines indicate wind in miles per hour.
Broken lines indicate relative humidity in percentage from readings taken at 8 A. M. and 8 P. M.
S—clear, P C—partly cloudy, C—cloudy, R—rain, Sn—snow.
Arrows fly with prevailing direction of wind.

THE CONSULTING ENGINEER

The Consulting Engineer" is prepared to reply, in this department, to any questions which our readers may ask regarding problems connected with the design and installation of mechanical equipments of buildings.

CONDUCTED BY IRA N. EVANS, C. E.

46—Testing House Heating Boilers and Checking Manufacturers' Ratings.

QUESTION: Do you know of any simple and ready method of determining the capacity of small house heating boilers and checking manufacturers' ratings?

ANSWER: This is a very pertinent question. Except in a few cases, none of the boiler catalogues gives the number of square feet of fire surface and, therefore, it is difficult to tell how large a boiler is in a given case. The size of the grate is given, but this has little or nothing to do with the size and amount of the heating surface in the boiler proper, as with a high intensity of fire and little heating surface the boiler can be made to do work beyond its ordinary capacity. There is also a clause in most boiler catalogues stating that "owing to the varying conditions under which the boiler is used, the boiler is not guaranteed beyond furnishing new castings, due to defects in manufacture" for which it is often impossible to hold the manufacturer.

Nearly all catalogues, however, give a rating in square feet of direct radiation based on a heat emission of 250 B. T. U. per hour per square foot of surface. It should not be overlooked, however, that these ratings may mean a flue temperature around 700° F., which, of course, would entail a waste of fuel.

Some catalogues give the evaporation per pound of fuel, based on 80% of the coal burned and in one notable case a four section, a five-section and a six-section boiler, all of the same type, are credited with 8 lbs., 8.5 lbs., and 9 lbs. of water evaporated per pound of fuel. This means that the last mentioned boiler is 12.5% more economical than the first boiler and, therefore, overrated in the first case.

The following is offered as an easy and non-technical method of making a test that will determine the rating of a boiler along the lines followed in boiler catalogues, eliminating all pipe covering and radiation, except the covering of the boiler.

Disconnect the main steam pipe and make a 1 in. or 1¼ in. connection to the steam outlet of the boiler with a valve, in such a manner that the water can be drawn as heated into one of two barrels set beside the boiler. The city water is already connected, with valve, for the supply. Place two thermometers that have been compared in tees, one in the feed pipe and one in the overflow pipe. Provide two barrels calibrated so that the exact weight of water at the final temperature is known when it reaches a certain mark on the barrel. If platform scales are handy and the weight of the barrels is known, the barrels do not need to be calibrated.

Get the fire in an observed condition and charge with fuel, so operating the boiler and fire that it will be in the same observed condition at the end of the test and interval of time. Weigh the coal or fuel if desired.

Run the water through the boiler so that all the water is heated from the hydrant temperature to say, 210° F., and vary the flow with the valves so that this difference will be as nearly constant as possible throughout the period of the test.

At the end of the period multiply the weight of water by the difference in temperature and divide by the time in hours. The result will be the B. T. U. per hour supplied by the boiler. If the boiler is rated on a heat transmission of 250 B. T. U. per hour per square foot of surface, the total B. T. U. divided by 250 will determine the rating of the boiler.

It is desirable to use a flue thermometer and burn the fuel so that the gases will not go out over 400° or 450° F., which can be done by regulating the draft.

Most of the high ratings reported are obtained by running an intense fire, with high flue temperatures, which is poor economy. The difference between the economy of high flue temperatures and low flue temperatures, however, is not more than 10% or 15%, but it means attention to the fire at more frequent intervals.

The test here outlined may be applied to hot water boilers as well as to steam boilers, but in that case the water boiler rating would be obtained by dividing by 185 B. T. U., instead of by 250 B. T. U.

Say we obtain 900 lbs. of water flowing through the boiler per hour and the outboard temperature is 210° F. with the city water entering the boiler at 50° F. In that case the weight, multiplied by 210—50=160°, is 900×160=144,000 B. T. U. per hour. The rating of the boiler should then be 144,000÷250=576 sq. ft. for steam and 144,000÷185=778 sq. ft. for hot water.

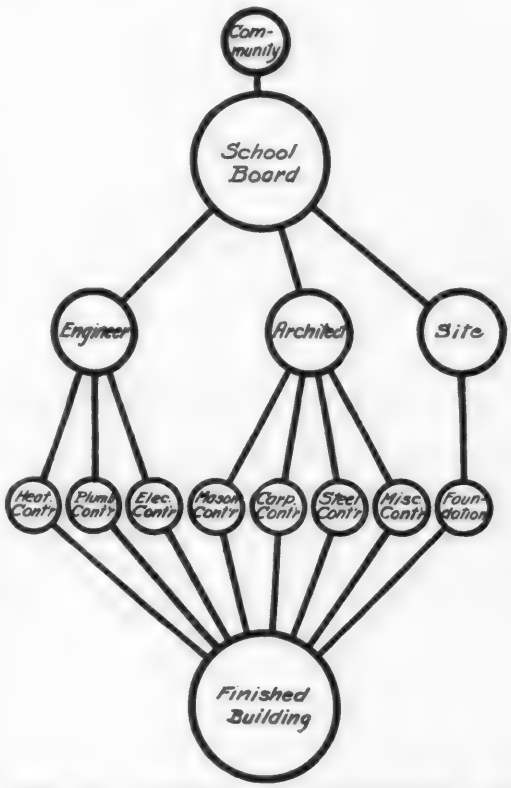
When the boiler is so large that the flow of city water requires an unusually high outboard temperature, the method here proposed would no doubt become cumbersome, and an evaporation test might be required. As most of the trouble is with the smaller house heating boilers, this test will usually answer the purpose. From the manufacturers' standpoint this test should be a favorable one. Due to the lower temperature of the medium, the heat absorption should be at a higher rate than when making steam, although there will not be much difference. The steam boiler, of course, should be full of water while the test is being made.

If any steam fitter or house holder desires to make tests of the character outlined, we shall be glad to analyze the data in this department. The principal expense would be the cost of the thermometers, $5 to $10, depending on the degree of accuracy desired. Thermometer cups, with mercury, set in tees, should be used and thermometers with graduations on the glass direct are desirable. After the thermometers are purchased, the only expense would be the time and barrels for measuring the water.

Business Organization in Schoolhouse Construction.

In an article by Harold L. Alt in the *School Board Journal,* the author presents an interesting diagram, which is reproduced herewith, showing what he terms the normal business organization of school construction and one which will give satisfactory results. As will be noted, in this arrangement, the community appoints the school board which, in turn, selects the site and the architect and engineer. The site, according to the safe bearing load of the soil, determines the foundation and the architect should not be held responsible for expensive foundations necessitated by poor bearing soil.

The method of operation indicated by the diagram is as follows: After the contracts are let, the engineer controls the heating, plumbing and lighting contractors' work, while the masonry, carpentry, steel, painting, plastering, roofing and miscellaneous work would be under the control of the architect. The work of these contractors, it is pointed out, is united to form a finished and complete



NORMAL BUSINESS ORGANIZATION OF SCHOOL CONSTRUCTION.

building and all disputes are carried back through the architect or engineer to the school board for its judgment.

"It is better," says the writer, "that the engineer be selected and appointed by the board as he is then better able to serve the board's interest alone when he is selectd by the architect and is, therefore, under obligations to him. It goes without saying, however, that the selection of an engineer who is antagonistic to the architect is not good business policy since they must co-operate."

Improvement in Building Operations.

Building construction in the United States during March, 1915, in 101 of the leading cities, totaled $68,406,846, which is 12 per cent below the corresponding figures for March, 1914. New York City reported a loss of 22 per cent; Chicago, a loss of 4 per cent; Philadelphia, a gain of 4 per cent; Boston, a gain of 4 per cent; Brooklyn, a gain of 15 per cent; Cleveland, a loss of 1 per cent; Detroit, a gain of 23 per cent; San Francisco, a loss of 64 per cent; Minneapolis, a loss of 34 per cent; Cincinnati, a gain of 57 per cent; St. Louis, a loss of 12 per cent; Los Angeles, a loss of 48 per cent; and Pittsburgh, a gain of 5 per cent.

The American Contractor, of Chicago, says: "The March showing of building operations throughout the country is not without its good points to those who are not extravagant in their expectations. There is a shrinkage as compared with March of last year, amounting to 15 per cent, but the total is increasing steadily month by month. Thus the January footings were $34,712,718; those for February, $40,872,773; while March yields activities represented by $53,162,521."

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

New York Chapter Holds Annual Dinner.

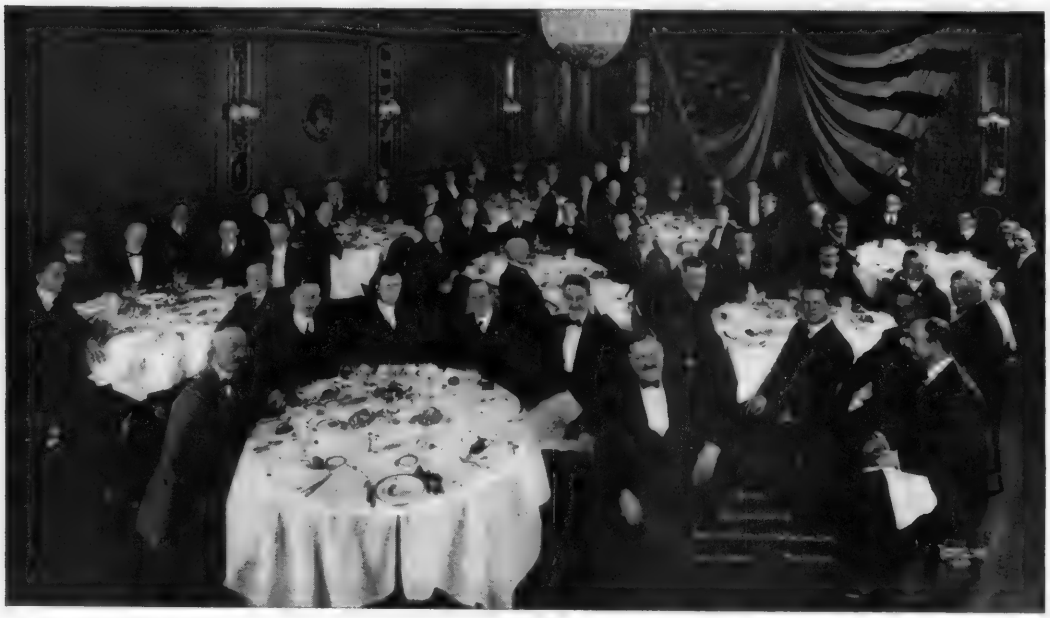
The staid demeanor of New York heating engineers underwent a severe test when the annual dinner of the New York Chapter of the American Society of Heating and Ventilating Engineers was "put across" at the Hotel Claridge, New York, May 17. Covers were laid for sixty members and guests, but, as it turned out, the diners and even the dinner itself, were as mere incidents in connection with the affair. The dinner committee had secured the services of Billy Murray and the engineers' quartette, who were accompanied by Franzen's orchestra, and also Miss Vera Letta and Miss Alta Cron. The combination proved irresistible and between these artists and the "slaughter house quartette," made up of local talent, the entertainment programme left little to be desired.

When the revelry had partially subsided, the retiring president, Walter S. Timmis, expressed his pleasure over the success of the dinner and stated that advantage would be taken of the opportunity to install the new chapter officers. The incoming president, William H. Driscoll, who was the first to respond, announced an interesting programme of meetings in course of preparation for next winter and then called on the other new officers to say a few words. Vice-President Arthur Ritter and Treasurer William J. Olvany responded and Secretary J. J. Blackmore, of the society, spoke for F. K. Davis, the new chapter secretary, who was unable to be present. Others who spoke were D. D. Kimball, Frank K. Chew, William J. Issertell and A. S. Armagnac.

The committee in charge of the dinner arrangements, which were carried out so successfully, was composed of W. H. Driscoll, chairman; George W. Knight, Charles E. Scott and George G. Schmidt.

Illinois Chapter Hears Report of Air Washer Committee.

A stereopticon lecture on dust and air washers, delivered by Dr. E. Vernon Hill, as chairman of the air washer committee, was the feature of the May meeting of the Illinois Chapter, held at the Great Northern Hotel, Chicago, May 10. The lecture followed the usual chapter dinner, which was attended by more than thirty members and guests. Dr. Hill spoke first on the general



NEW YORK CHAPTER DINNER, AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS, AT THE HOTEL CLARIDGE, NEW YORK, MAY 17, 1915.

subject of dust and showed its importance in the scheme of the universe. He then explained how fog, rain and snow are produced through the condensation of moisture on the dust in the air.

Slides were then shown of the experimental air-washing plant on the roof of the Chicago City Hall. Here an effort is being made to determine a simple method of making air tests which can be adopted as standard, rather than to make comparative tests of the efficiency of the different air-washers themselves. The present procedure is to preserve the air that passes through the air-washer in bottles of distilled water. The water is subsequently evaporated and the residue dried and analyzed. Dr. Hill stated that some interesting results are anticipated from the tests in the near future. The present equipment includes a Webster air-washer.

The routine business transacted included the appointment by President Newport of a nominating committee, composed of E. J. Claffey, C. W. Johnston and J. F. Tuttle.

Massachusetts Chapter Closes Its Season.

The last meeting of the Massachusetts Chapter for the season was held May 12, when a committee of three was appointed to draft a programme for next season. One of the first subjects will be a stereopticon lecture on the heating system in the new buildings of the Massachusetts Institute of Technology, to be delivered by George Libby. The committee at work on the programme is composed of Messrs. Smallman, Boltz and Morrison. The chapter appointed Major James W. H. Myrick as its delegate to the summer meeting of the society at San Francisco in September. The proposed amendment to the chapter's by-laws, changing the date of the annual meeting from October to May, was laid over until the next meeting in the fall.

The election of the following new members of the American Society of Heating and Ventilating Engineers is announced:

MEMBERS.

Alfred D. Alexander, Bessemer Bldg., Pittsburgh, Pa.
Orrie H. Allinson, Jobstown, N. J.
George E. Black, Parliament Bldgs., Toronto, Ont.
George Boon, 1708 Arch St., Philadelphia, Pa.
John H. Brown, Public Works Dept., Winnipeg, Man.
Clyde W. Colby, 464 Spitzer Bldg., Toledo, Ohio.
Jesse Coogan, 404 State St., Salt Lake City, Utah.
Linwood B. Cornell, 88 Union Ave., Portland, Ore.
Arthur P. Goldsmith, 108 So. 18th St., Philadelphia, Pa.
Irwin F. Grumbein, 785 Drexel Bldg., Philadelphia, Pa.
Edward M. Harrigan, 231 First St., Detroit, Mich.
Laurence H. Henschen, 109 Bluff St., Joliet, Ill.
Donald B. Howard, Des Moines, Ia.
Herman D. Jackes, 278 Franklin St., Bloomfield, N. J.
Otto J. Juttner, 434 Jefferson St., Milwaukee, Wis.
Charles W. Kimball, 6 Beacon St., Boston, Mass.
Walter Klie, 1133 Bolivar Rd., Cleveland, Ohio.
Nicholas J. Mathey, Le Mars, Ia.
Edward T. Murphy, 734 Real Estate Trust Bldg., Philadelphia, Pa.
George B. Nichols, State Capitol, Albany, N. Y.
Lee Nusbaum, 1119 N. Howard St., Philadelphia, Pa.
George T. Palmer, City College, 139th St., New York.
A. J. Purcell, P. O. Box 728, Little Rock, Ark.
Samuel F. Richards, 1008 Mutual Assurance Bldg., Richmond, Va.
C. M. Ripley, 15 West 38th St., New York City.
Samuel F. Smith, 4425 Euclid Ave., Cleveland, Ohio.
Charles W. Tholen, 821 Plymouth Bldg., Minneapolis, Minn.
Louis S. Thomason, 353 East 14th St., Brooklyn, N. Y.
William H. Timm, 305 Abbott Bldg., Philadelphia, Pa.
R. H. Trane, La Crosse, Wis.
Louis H. Tripp, 1729 New York Ave., N. W., Washington, D. C.
Herbert R. Voelcker, 506 Y. M. C. A. Bldg., Houston, Texas.
J. Walter Williams, 213 East Seneca St., Ithaca, N. Y.

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Leon L. Munier, 31 Zabriskie St., Jersey City, N. J.
William E. V. Shaw, 750 Summit Ave., Milwaukee, Wis.

NATIONAL ASSOCIATION OF MASTER STEAM AND HOT WATER FITTERS

Programme for Twenty-seventh Annual Convention.

Arrangements have been practically completed for the twenty-seventh annual convention of the National Association of Master Steam and Hot Water Fitters which will be held in Milwaukee, Wis., June 21 to 24, with headquarters at the Hotel Wisconsin. Following is the programme:

MONDAY, JUNE 21.

10 a. m.—Meeting of Board of Directors.

TUESDAY, JUNE 22.

10 a. m.—Addresses of welcome by Mayor Bading and Judge J. C. Karel.

12 m.—Luncheon for women, Colonial Room, Hotel Wisconsin.

2 p. m.—Opening meeting, address on national defence by Mayor William Mather Lewis, of Lake Forest, member of the Navy League.

8 p. m.—Carnival night at the Badger Room, Hotel Wisconsin.

WEDNESDAY, JUNE 23.

10 a. m.—Executive session, for members only.

10 a. m.—Golf tournament at the Blue Mound Country Club for women and non-members attending the convention.

2 p. m.—Automobile trip through Milwaukee parks.

8 p. m.—Bowling tournament at the Kurtz alleys.

THURSDAY, JUNE 24.

10 a. m.—Election of officers.

2 p. m.—Boat ride on Lake Michigan.

The following committee from the Milwaukee Association will have general charge of the arrangements:

Edmund Grassler, representing Grassler & Gezelschaap; Fred Kaufman, representing Kaufman-Haas Heating Co.; Frank Downey, representing Downey Heating & Supply Co.; Hugo Franke; I. Harrimann, representing Thompson & Harrimann; Emil Henoch, representing Wenzel & Henoch; Albert Luebke, representing Schumann & Luebke; F. H. Meadows, representing Marvel Spencer Heating Co.

This general committee has appointed the following sub-committees:

Committee on Finance—Edmund Grassler, Frank Downey and F. H. Meadows.

Committee on Entertainment for Ladies—Wm. LaCompte, representing Jenkins Bros., of New York, as chairman, and J. B. Garfield, representing the American Radiator Co., New York, members ex-officio; I. Harrimann, Hugo Franke and Frank Downey.

Committee on Automobiles—Fred Kaufman, Emil Henoch and Albert Leubke.

The Elk's Club will keep open house for visitors during the convention.

MILWAUKEE'S ENTERTAINMENT COMMITTEE FOR THE FORTHCOMING CONVENTION OF THE NATIONAL ASSOCIATION OF MASTER STEAM AND HOT WATER FITTERS.

New York State Association.

New officers were elected as follows at the annual meeting of the New York State Association of Master Steam and Hot Water Fitters, which was held in New York City, May 11: President, N. Loring Danforth, Buffalo; vice-president, William H. McKiever, New York; secretary-treasurer, W. J. Olvany, New York; recording secretary, Henry B. Gombers, New York. Board of Directors: Edward F. Joy, Syracuse; John R. Sheehan, Schenectady; William H. Curtin, Brooklyn; Jeremiah R. Smith, Oneida, and George H. Drake, Buffalo. Among the guests of the association were Edmund Grassler, of Milwaukee, third vice-president of the National Association of Master Steam and Hot Water Fitters, and F. H. Meadows, secretary of the Wisconsin State Association.

It was voted to send a representative to Albany to urge Governor Whitman to veto Senate Bill No. 2073 as being inimical to the interests of the contracting steam fitter. Among other general matters that came up for discussion were the reports of conferences with State Architect L. F. Pilcher, relating to methods followed by his depart-

ment in calling for certified checks to accompany bids for state work; the state alien labor law, and reports of conferences with Cornell University officials relating to work to be done at that institution and its relation to the state laws.

Following the convention the members were entertained at dinner at the Building Trades Employers' Association Club by the New York City Association, where the features included a vaudeville programme.

Pennsylvania State Association.

Addresses on a number of important subjects connected with the trade were a feature of the twenty-sixth annual convention of the Pennsylvania State Association of Master Steam and Hot Water Fitters, held in Philadelphia, May 27. Among the subjects discussed were: "Cost Accounting Methods as Applied to Compensation and Other Laws About to Be Enacted in This State," "Establishing Uniform Practice As to the Requirement of Separate Specifications and Direct Bids for Plumbing, Heating, Ventilating and Electric Work on All Buildings." The speakers also took up efforts to standardize other difficult problems with the idea of improving conditions.

Current Heating and Ventilating Literature.

Under this heading is published each month an index of the important articles on the subject of heating and ventilation that have appeared in the columns of our contemporaries. Copies of any of the journals containing the article mentioned may be obtained from THE HEATING AND VENTILATING MAGAZINE *on receipt of the stated price.*

AIR CONDITIONING—

Air Conditioning. J. Irvine Lyle. Supposed benefits from air washing and humidifying, and the application to various industrial plants; heating and cooling methods and machines. Ills. Discussion. 8,500 w. Pro Engrs' Club of Phila—Jan., 1915. 60c.

PIPING—

Drainage of Low-Pressure Piping. Charles L. Hubbard. Method of utilizing heat from oily drips, removing oil from exhaust and drainage of feed-water heaters. Ills. 1,200 w. Prac Engr, Chicago—March 1, 1915. 20c.

Economical Design of Low-Pressure Steam Mains. A. Langstaff Johnston, Jr. The laws governing the flow of steam in pipes are worked out for low-pressure installations, especially for steam-heating purposes, presented in graphic form for solving the special problems of any plant. 3,000 w. Engng Mag—April, 1915. 40c.

SATURATED AIR—

Properties of Saturated Air. W. D. Ennis. Underlying principles, method of computing table of properties of air saturated with moisture, with examples of applications of table. 1,500 w. Power—March 23, 1915. 20c.

VENTILATION—

Safety Through Good Ventilating Systems. Edward T. Walsh. Causes of vitiated air, effects, and methods of ventilation. Ills. 4,500 w. Safety Engng—March, 1915. 40c.

NATIONAL DISTRICT HEATING ASSOCIATION

Convention Notes.

An event for the men not on the regular program was the luncheon of the Electric Club at the Hotel Sherman on Thursday. A general invitation was extended to the delegates to be present and many availed themselves of the opportunity.

Also, under the guidance of Mr. Kelly, inspection trips were made by the men to the Fisk street power station and to some of the power and heating plants of the Illinois Maintenance Company.

The appearance of the new book on "District Heating," by S. Morgan Bushnell and Fred. B. Orr, at the convention, proved an interesting feature and the booth where copies were being sold was one of the much-visited spots in the exhibtion hall. Both Mr. Bushnell and Mr. Orr came in for many congratulations on their treatment of the subject, as well as on the fine appearance of the book itself.

The exhibition hall gossip included a report of the proposed organization of manufacturers of vapor steam heating systems, with the object of developing a trade name for such systems, such as "air return systems," and boosting their wider adoption by architects, engineers and contractors. It was reported that informal meetings of representatives of these manufacturers were now being held in New York at stated intervals.

President David S. Boyden Entertains at Luncheon.

One of the pleasant features of the Electric Club luncheon at the Hotel Sherman on Thursday was a luncheon party given by the new president of the association, David S. Boyden, to the past presidents and some of the other members. His guests were Past Presidents A. C. Rogers, R. D. De Wolf, A. D. Spencer, S. Morgan Bushnell, and C. R. Bishop, A. P. Biggs, Secretary D. L. Gaskill, J. G. De Remer, Byron T. Gifford, George W. Martin and A. S. Armagnac.

Panama-Pacific International Exposition Exhibits.

1.—THE BRISTOL COMPANY.

The exhibit of the Bristol Company, of Waterbury, Conn., at the San Francisco exposition includes samples of its extensive line of recording instruments for pressure, vacuum, liquid level, differential pressure, temperature, electricity, time, motion, speed and humidity. The exhibit is located in the Palace of Machinery in Section 32 and occupies a floor space 40x30 ft. The decoration of the superstructure of the booth, shown in the accompanying illustration, are actual models of Bristol recording instruments. On the lower part of the outside columns of the booth, working models of Bristol instruments are exhibited in operation, producing records of atmospheric temperature, the level of the tide in the bay, also records of conditions on the electrical circuits in the Palace of Machinery. Inside the booth the outfits include the new Bristol patent long distance electric thermometers. A booklet reproducing photographs of the complete booth, and each of the different sections may be had upon request, by addressing the company.

THE BRISTOL COMPANY'S BOOTH AT THE PANAMA-PACIFIC INTERNATIONAL EXPOSITION, SAN FRANCISCO.

INTERIOR OF THE BRISTOL COMPANY'S BOOTH.

Use of Hot Condensation for Heating Domestic Water Supply.

Commenting on a discussion in last month's issue in the "Consulting Engineer" Department, on "Cooling Coils for Lowering Temperature of Condensation," H. W. Sims of the Sims Co., Erie, Pa., calls attention to the paragraph stating that "it is always policy to utilize this heat in some manner," and says:

"We have furnished a number of our heaters designed for this very purpose. using the hot condensation for heating water for domestic use. As a rule, the temperature of the condensation is reduced to a point very close to that of the cooling water, which is much more satisfactory for discharge to the sewer than a temperature near the boiling point.

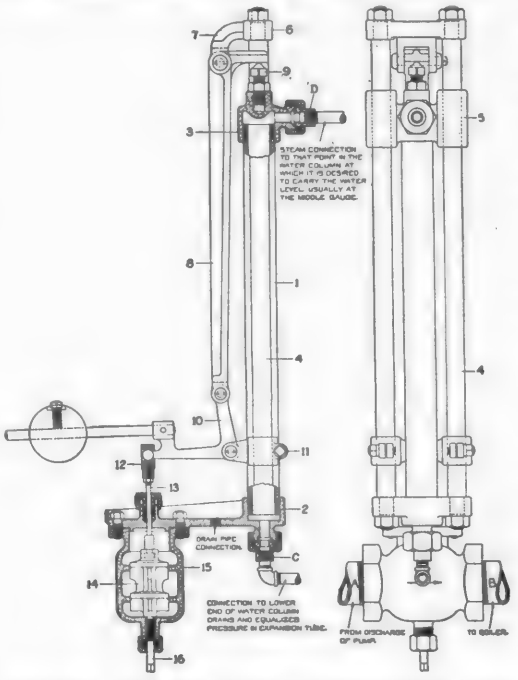
"The most satisfactory method of accomplishing this result, we find, is the use of the type of heater shown on page 79; the lower bank of tubes is so arranged as to pass the water through small groups of tubes making several passes from inlet to outlet. These tubes are located in the bottom of the heater, therefore, in the coldest water, making the most effective heat transfer. We find in some cases that the heat absorbed from the hot condensation is alone sufficient to provide all the hot water required for domestic purposes at a satisfactory temperature. For summer use, if live steam is available, a separate group of tubes can be used for water heating, or a gas heater may be connected, using the tank for storage.

"An installation using condensation in the lower group of tubes, supplemented by live steam in the upper group of tubes, was recently made in the new Commerce Building in Erie, Pa., with very satisfactory results. The condensate leaves the tubes at

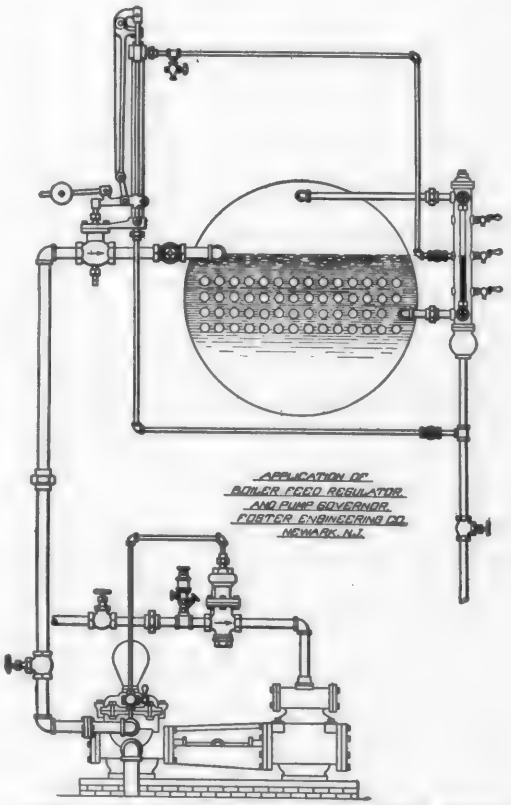
a temperature of about 70 degrees to 80 degrees F. and very little live steam is required to maintain a temperature of 125 degrees to 135 degrees F. steadily."

Trade Literature.

FOSTER AUTOMATIC FEED WATER REGULATOR, announced as the latest scientific production of the Foster Engineering Co., Newark, N. J., is illustrated and described in a circular just issued by the manufacturers. The appliance is fully guaranteed to maintain water at the predetermined height, regardless of quantity or qualty of coal used; to insure against flooding or "low water"; to aid in increasing the steaming power and prolonging the life of the boiler. It is also described as thoroughly automatic. Its operation is as follows: Normally the water in the boiler or water column seals the end of the pipe leading to the top of the expansion tube, so that steam is excluded therefrom and the tube is cool or contracted. In this condition of the expansion tube the long arm of the bell crank lever "8" is free to swing outward from the expansion tube and allows the weight to depress the arm of the lower bell crank "10," so as to slide valve "14" downward into closed position, cutting off and preventing water from entering the boiler through feed line. When the water recedes below the predetermined boiler level it uncovers the opening in the pipe leading from the water column to the top of the expansion tube and permits steam to enter


STEAM CONNECTION TO THAT POINT IN THE WATER COLUMN AT WHICH IT IS DESIRED TO CARRY THE WATER LEVEL. USUALLY AT THE MIDDLE GAUGE.
DRAIN PIPE CONNECTION.
CONNECTION TO LOWER END OF WATER COLUMN DRAINS AND EQUALIZES PRESSURE IN EXPANSION TUBE.
FROM DISCHARGE OF PUMP.
TO BOILER.

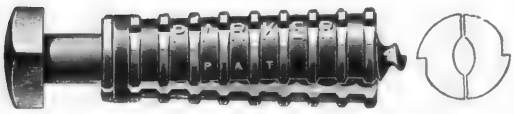
FOSTER BOILER FEED REGULATOR AND PUMP GOVERNOR.



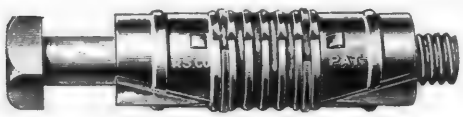
APPLICATION OF FOSTER BOILER FEED REGULATOR AND PUMP GOVERNOR.

the same. This heats and expands tube "1," carrying the adjusting screw "9," which can be set for any desired variation, upward against the short arm of bell crank lever "8," thus swinging the long arm of the latter inwards or towards the expansion tube. This carries the lower bell crank lever "10" and raises the weight, drawing valve "14" upward, opening the main feed valve, permitting water to flow through the feed pipe into the boiler. The flow continues until steam is again cut off from the expansion tube "1," allowing the contraction of the latter sufficiently to close valve "14."

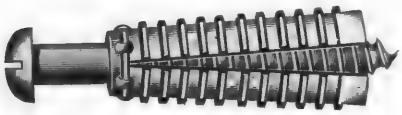
PARKER EXPANSION BOLTS, featured as the only expansion bolts which cannot turn in the hole, are described in new circular matter as the latest product of the Parker Supply Co., 518 West 45th Street, New York. They are made in three types, the lag screw type, made of malleable iron; the machine bolt type, also made of malleable iron; and the crew screw anchor, made of composition metal. In the lag screw type, the reversibly directed projections, which, it is stated, are to be found only on Parker expansion shields, are described as the greatest single improvement yet made on expansion bolts, as they prevent the shield from turning in the hole. The steel



Lag Screw Type



Machine Bolt Type



Screw Anchor

PARKER EXPANSION BOLTS.

spring band of this type, allowing free and full expansion, is also to be noted. The machine bolt type of expansion bolt has interlocking nuts with little pins on the outside which lock into openings in the shield, preventing the shield from coming apart. They also have a ribbed surface. In the screw anchor type, the ends are made extra heavy and they also have breakable connections to prevent the anchor from taking a corkscrew twist.

LAGONDA BOILER ROOM SPECIALTIES, published by the Lagonda Mfg. Co., Springfield, O., illustrates this company's several types of boiler tube cleaners, with latest improvements, and boiler quick repair tools. It also covers the company's line of automatic cut-off valves and multiple strainers. Size 3½x6 in. (standard). Pp. 16.

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*Every other month.

TRADE AND MISCELLANEOUS NOTES

Coming Events.

June 21-24, 1915.—Twenty-seventh annual convention of the National Association of Master Steam and Hot Water Fitters, in Milwaukee, Wis. Headquarters at the Hotel Wisconsin. Secretary, H. B. Gombers, 260 West Broadway, New York.

June 30 and July 1, 1915.—Annual convention of the National Association of Master Plumbers, at Chicago, Ill.

September 16-18, 1915.—Midsummer meeting of the American Society of Heating and Ventilating Engineers, in San Francisco, Cal. Headquarters at the Hotel Bellevue. Secretary, J. J. Blackmore, 29 West 39th street, New York.

Deaths.

Robert Gordon, of Chicago, Ill., an old-time steam-fitting contractor in that city, died at his home May 10. He was 55 years old and had been in business in Chicago for the past thirty years.

Central Station Heating Notes.

Martinsville, Ind.—A central station heating system for Martinsville is being considered, the plan being to have the local gas and electric company furnish exhaust steam from their plant, the steam to be conducted through a 10-inch main around the square. Manager Stewart, for the company, has agreed to install new boilers, if necessary.

Des Moines, Ia.—One of the principal points in the discussion of the proposed heating franchise, which has been applied for by the Des Moines Electric Company, is whether the company should be allowed to earn 8 per cent on its capitalization for a period of eighteen months. A number of business men point out that since the company's bonds are sold below par, the proposal to issue $300 for every $100 of capital stock would result in a return of over 12 per cent on the capital stock account. As a result efforts are being made to reduce the rates proposed.

Cleveland, O.—Figures compiled for the general ledger report of the Cleveland Department of Finance show that the earnings of the municipal steam-heating plant at the Fairmount Station for the past year were $624.31 less than the operating costs. Heat users paid the city $22,696. It cost $23,321 to operate the plant. The loss mounts higher when interest charges on the $179,000 investment are considered, as this would amount to $8,950. Nothing was deducted for depreciation on the equipment. The heating plant has now been operated for three years, but the records for each year show a loss. The city charges 30 cents per 1,000 lbs. of steam which is supplied to a section around Euclid avenue and East 105th street.

Rock Island, Ill.—Construction of a central heating plant to cost $10,000 has been recommended by Architect C. D. McLane, in connection with the erection of the new county jail. The matter is before the supervisors.

Tacoma, Wash.—The starting of work on the new central heating plant of the Tacoma Central Heating Company at Fifteenth and A streets, has been held in

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abeyance pending an assurance by the city council that it will make no further effort to prosecute the referendum against the franchise granted to the company a year ago. This assurance has now been given and work will proceed at once. As announced last month, the franchise has been held valid by Judge Easterday on the ground that the referendum petition filed by the stationary engineers of the city was insufficient and improperly prepared. The new plant, it is estimated, will cost $250,000. Commissioner Mills and Mayor Fawcett expressed themselves as being in favor of voting out the proposed appeal and allowing the new enterprise to go ahead. Negotiations have recently been conducted by the city with the Tacoma Central Heating Company for the latter to agree to furnish high-pressure steam for operating an electric generating plant as an auxiliary to the city's system. It was decided that the city will not need such an auxiliary within the next five years, so that matter was dropped for the time being.

Miscellaneous Notes.

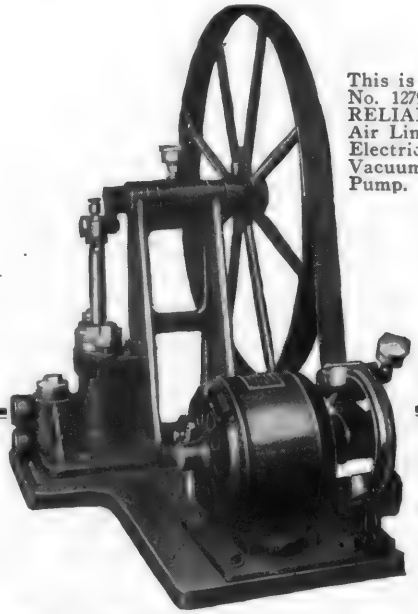
Chicago, Ill.—Dr. John Dill Robertson has been appointed commissioner of health in Chicago. He is described as one of the progressive men of Mayor Thompson's cabinet.

Claude A. Bulkeley, New York, consulting engineer, has been appointed chief consulting engineer for the Canadian Domestic Engineering Co., Ltd., Montreal, Canada. Mr. Bulkeley has left for Montreal, where his headquarters will be located.

Daniel M. Luehrs, until recently engineer in charge of the air washer department of the American Blower Co., Detroit, Mich., has been appointed general superintendent of the Guilford Avenue plant of the Crown Cork & Seal Co., Baltimore.

Springfield, O.—Plans and specifications have been filed by Architect R. C. Gotwald for a central power plant and heating system for Wittenberg College, to cost between $10,000 and $15,000. Bids were to be opened May 26.

Olympia, Wash.—As the result of a decision of the Supreme Court of Washington, upholding the emergency clause of the appropriation fund, money will be available for a number of items for new construction and improvements to public buildings, including a heating system for the old buildings of the Eastern Washington Hospital for the Insane at Medical Lake; Central heating system for the State School for the Blind, and the remodeling of the steam-heating plant of the Bellingham Normal School, at Bellingham.



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National Pipe and Supplies Association, at its annual meeting, held in Buffalo, N. Y., May 11-13, went on record as endorsing the Stevens Bill, now before Congress which is described as "a measure that will protect the public and give independent merchants an opportunity to do business under legitimate conditions." In the preamble of the resolution endorsing the bill it is stated that the abolishment of uniform retail prices on standard goods is directly in the interest of large aggregations of capital operating through systems of chain stores and mail-order houses which, whenever possible, have adopted the practice of advertising articles of known merit and established value at cut rates or below cost for the purpose of creating the impression that their entire stocks are bargains. A paper by Elbert H. Gary, chairman of the board of directors of the United States Steel Corporation, was read on "Co-operation, Its Influence on American Industry." Felix H. Levy addressed one of the sessions on "The New Federal Business Legislation." Other speakers were J. Harry Tregoe, of the National Association of Credit Men, whose topic was "The Standard of Business Practice," and Dr. Stanley L. Krebs, who spoke on "The Secret Power of Suggestion in Advertising, Salesmanship and Business Building." The following officers were elected: President, Alex. B. Pierce, St. Louis, Mo.; first vice-president, J. S. Smith; second vice-president, F. M. Sheldon, Boston; treasurer, G. W. K. Taylor, New York; secretary, George D. McIlvaine, Pittsburgh; executive committee, L. C. Huesmann, Indianapolis, Ind.; George B. Limbert, Chicago; George V. Denny, Savannah, Ga.; William Q. Wales, Boston; C. J. Clark, Philadelphia; T. F. Young, A. A. Merkel, Cincinnati, and J. B. Rahm, Omaha. It was decided to hold the 1916 meeting in Pittsburgh.

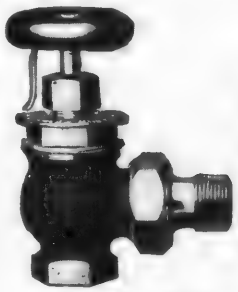
Central Trade Golf Association, at its annual meeting, held May 4, in Pittsburgh, elected the following officers: President, J. K. Frye; secretary-treasurer, W. B. Bryar; tournament committee: E. H. Eggleston, Jr., Thomas R. Kenney and J. A. Weldon. It was voted to limit the membership in the association to 100.

Eastern Supply Association will meet at Atlantic City, N. J., June 16, 1915. Headquarters will be at the Strang Hotel.

Central Supply Association will hold its midsummer meeting in Chicago, June 16, with headquarters at the Auditorium Hotel.

Canton, O.—County officials and court house employees have petitioned the county commissioners to repair the fan ventilating system in the court house. An elaborate mechanical ventilating system was installed when the court house was remodeled a few years ago, but it has been allowed to get in bad repair and has not been used for several seasons. It is estimated that with a new fan and motor and some incidental repairs the system could be put into working order again.

Nashville, Tenn.—The building inspec-



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Please mention THE HEATING AND VENTILATING MAGAZINE *when you write.*

tion department of Nashville reports that every effort has been bent toward the most complete ventilation of moving picture theatres which have been constructed under the new building laws of Nashville.

Freeport, Ill.—A bill has been introduced in the Illinois Legislature by Lee O'Neil Brown, which would compel every person who has a steam-heating plant that registers 10 lbs. or over of steam pressure to get a licensed engineer to operate the plant.

Manitowoc, Wis., is to have an independent heating plant for its new high school building which, with a heating and ventilating system, and a plumbing system, will cost $16,595. The heating and ventilating alone will amount to $5,525.

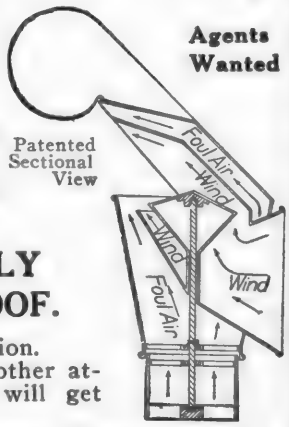
Fargo, N. D.—The board of trustees of the agricultural college have received bids for putting in new heating mains from the central station on the college campus to all the buildings of the institution. The last legislature appropriated $15,000 for this work. The awarding of the contract was to be made later.

Joliet, Ill.—According to the terms of a bill introduced in the Illinois Legislature by Squire F. Tompkins of Will County, where an expenditure of more than $1,000 is contemplated by a school board, the

American Standard Automatic Air Pump

Having a Special NO-DOWN-DRAFT feature, it insures a steady upward pull at all times.

Agents Wanted



Patented Sectional View

ABSOLUTELY STORM PROOF.

Needs no attention.
Has no fans or other attachments that will get out of order.
Will give an average displacement at the rate of over 1000 linear feet per minute.

Specified by the New York and Massachusetts Boards of Education.

Century Ventilating Co.,
430 East 23rd Street.

Ninety In the Shade

Do you feel like doing much work under this condition?

Well—it isn't necessary. You can install

Carrier Humidifiers

and cool the air to the outside wet-bulb temperature—or an average cooling of about 15° F.

Don't you feel that you owe it to yourself—and your clients—to investigate?

A card will bring our catalog 13-36, or our engineer.

CARRIER AIR CONDITIONING COMPANY OF AMERICA

39 Cortlandt Street, New York City

Boston **Philadelphia**
Buffalo **Chicago**

An Installation of 4780 Detroit Packless Radiator Valves

In this, the largest office building in the world, every item of equipment was selected with the idea of obtaining a harmonious combination of utility and beauty.

Permanency, combined with maximum service to tenants was the big consideration in every instance.

Detroit Packless Radiator Valves, with which all the radiators are equipped, won their place in the specifications through sheer merit alone.

In the first place Detroit Packless Valves do not leak around the stem nor need re-packing and in addition they meet the all-important requirement of maximum utility, combined with beauty of line and finish.

Their lines are substantial, symmetrical and pleasing. The metal surfaces have a smooth satin finish; the mahogany finished handles are large and nicely proportioned. In fact Detroit Packless Valves will harmonize with the most beautiful surroundings.

And the line is complete—angle—corner—globe gate—in sizes for every kind of installation on steam or hot water systems.

Illustrated booklet V-46 tells the whole story—shows the complete line and gives roughing-in dimensions.

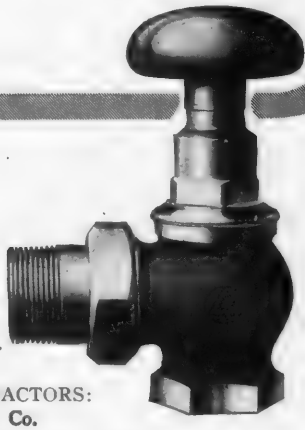
DETROIT LUBRICATOR COMPANY
DETROIT, U. S. A.
CANADIAN DETROIT LUBRICATOR COMPANY, LTD. WALKERVILLE, ONTARIO, CANADA

Makers of the Stewart Carburetor

Equitable Building, New York.

ARCHITECT: Ernest R. Graham.

HEATING CONTRACTORS: Thompson-Starrett Co.



tion department of Nashville reports that every effort has been bent toward the most complete ventilation of moving picture theatres which have been constructed under the new building laws of Nashville.

Freeport, Ill.—A bill has been introduced in the Illinois Legislature by Lee O'Neil Brown, which would compel every person who has a steam-heating plant that registers 10 lbs. or over of steam pressure to get a licensed engineer to operate the plant.

Manitowoc, Wis., is to have an independent heating plant for its new high school building which, with a heating and ventilating system, and a plumbing system, will cost $16,595. The heating and ventilating alone will amount to $5,525.

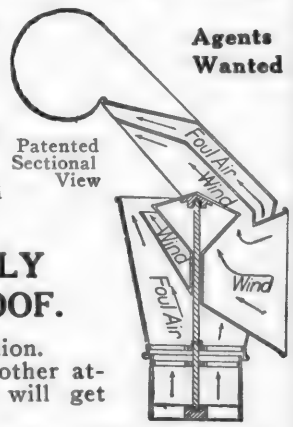
Fargo, N. D.—The board of trustees of the agricultural college have received bids for putting in new heating mains from the central station on the college campus to all the buildings of the institution. The last legislature appropriated $15,000 for this work. The awarding of the contract was to be made later.

Joliet, Ill.—According to the terms of a bill introduced in the Illinois Legislature by Squire F. Tompkins of Will County, where an expenditure of more than $1,000 is contemplated by a school board, the

American Standard Automatic Air Pump

Having a Special NO-DOWN-DRAFT feature, it insures a steady upward pull at all times.

Agents Wanted



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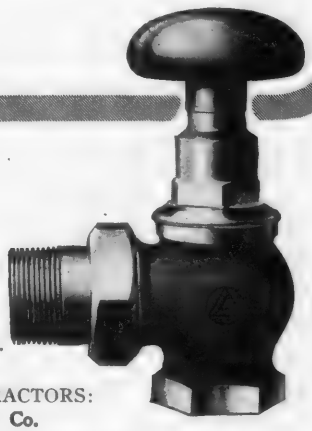


matter would have to be placed before the people at the next regular school election. It is pointed out that this might necessitate closing the schools for more than a year in case a heating plant, for instance, should need to be replaced.

Chicago, Ill.—Indictments have been returned by the United States grand jury in Judge Landis's court in Chicago against eighteen union officials, forty-one electrical and lighting fixture contractors as individuals, and forty-one firms and corporations, charging them with violating the Sherman anti-trust law and the interstate commerce act through alleged agreement between contractors and unions through which outside contractors and material are barred from Chicago. In return for their boycotting of outside interests the unions are supposed to have gained by the employment of union men only and the granting of better wage conditions. The contractors indicted are all members of the dominant associations in the electrical line—the Chicago Switchboard Manufacturers' Association and the Chicago Lighting Fixture Association.

Manufacturers' Notes.

Sarco Engineering Co., New York, has opened a branch office in Detroit, in the New Telegraph Building. F. T. Craig is in charge. The company manufactures the Sarco line of heating specialties.

Hughson Steam Specialty Co., Chicago, Ill., has moved its Chicago offices to its factory at 5021-5023 South State Street, Chicago.

Walker & Pratt Mfg. Co., Boston, Mass., has appointed A. P. W. Burbank as one of its boiler salesmen, to cover the Maine and New Hampshire territory. Mr. Burbank was formerly New England sales agent for the New England Fan Co.

American Radiator Co., Chicago, Ill., has declared the regular quarterly dividend of 1¾ per cent. on its preferred stock, payable May 15; also a regular quarterly dividend of 4 per cent. on the common stock, payable June 30. President Wooley of the American Radiator Company, is quoted by the Wall Street Journal, of New York, as stating that the company's domestic business is holding its own very satisfactorily compared with a year ago.

Muskegon, Mich.—A new concern to manufacture cast-iron heating and plumbing supplies will be located at Muskegon as the result of an agreement made by the Muskegon Chamber of Commerce with James Bradley, of Pittsburgh. The company will build a $12,000 plant in Muskegon

Bring the Invigorating Air of the Country Into Your Offices, Homes, Club Rooms and Factories

Nothing like this Sterling Air Purifier for your buildings. Simply attach the motor to an ordinary electric socket, and the apparatus completely and quickly cools the air, extracts the dirt and dust, and keeps the room clean, fresh and cool.

Portable—operates independently —requires little floor space.

Surprisingly inexpensive.

Sterling Air Washer

Let us show you the operation and advantages you can attain in your office or factory thru the use of this apparatus.

BLOMFELDT & RAPP CO.

104-24 N. Jefferson St., Chicago

District Offices: 801 Longacre Bldg., N. Y.; 402 Endicott Bldg., St. Paul.; 1210 Scarritt Bldg., Kansas City, Mo.; 713 Realty Bldg., Spokane, Wash.

Complete Outfits $75.00 Up

Sizes 100 to 5,000 C.F.M.

"YOU CAN SEE THE SPRAY"

Please mention THE HEATING AND VENTILATING MAGAZINE *when you write.*

The Webster System of Automatic Humidity Control

is readily applied to the various types of

WEBSTER AIR WASHERS

It is perfect in principle and accurate in operation.

It possesses features that make it both practical and simple, among which may be mentioned:

1. Separate control, by ordinary thermostats, of the average dry and wet-bulb temperatures of air leaving the Air Washer.
2. Independent of unequal air and spray distribution and temperature, ordinarily causing unequal humidification, supersaturation, inaccurate results, etc.
3. Quick response—the chief controlling thermostat subject to water, a medium with four times the specific heat of air.
4. Inherently safe against over humidification.

Send for catalogue "C"— 88 pages of valuable information
Consult us regarding Air Conditioning Apparatus for any purpose

WARREN WEBSTER & COMPANY, CAMDEN, N. J.

Established 1888 **Branches in Principal Cities**

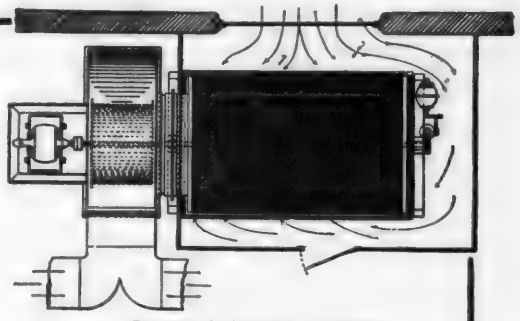
Kingwelton Talks No. 5

There is no Contact of Dirt Deposits and Air

in the

KINGWELTON ROTARY AIR PURIFIER

No recirculation of muddy water through the incoming air.



Patented August 13, 1912
Plan View

The mesh surrounding the drum carries the impurities to the water bath, the washed and purified air being drawn directly from the drum. By the use of this apparatus the air is cleansed of all dirt particles.

A substantial test was made at the Pennsylvania Railroad Station, Pittsburgh, Pa., by the Railroad Company, where the local air is heavily charged with carbon from coal. The Kingwelton Rotary Air Purifier removed 99% of the impurities, depositing the carbon in the bottom of the tank for removal.

This apparatus is manufactured at our own works, in sizes to suit conditions.

Plans furnished for ventilating plants, with air purifier combined. Cost of operating apparatus after installation 9/10 less.

Write for descriptive circular.

WELLS & NEWTON CO., Ave. B and 17th St., New York

at the foot of Western Avenue, the contract for the building having already been let to C. O. Jensen.

Vapor Heating Co., Philadelphia, Pa., announces the removal of its New York office to 597 Fifth Avenue, where it will enjoy largely increased facilities. Charles E. Scott is the New York district manager.

Marsh Valve Co., Dunkirk, N. Y., announces the removal of its business to Erie, Pa. The company's general offices will be located in the Marine Bank Building, in that city. The company has entered into a long term contract with the Hays Mfg. Co. for the manufacture of its entire line of radiator and heavy-duty valves. The Hays Mfg. Co. will also handle the mill supply sales. The officers of the company are: President, W. C. Marsh; vice-president and treasurer, Newell F. Gould.

U. S. Blow Pipe & Dust Collecting Co., Chicago, Ill., is the new name of the U. S. Steel Tank & Pipe Co., exhaust system contractors, of Chicago and St. Louis. The new name, it is stated, is more representative of the company's growing business in shaving and fine dust collecting for woodworkers, grain elevators, mills and all industries where dust and refuse are created.

Clarage Fan Co., Kalamazoo, Mich., has opened a new sales office in Cleveland, O., in charge of R. G. Ferguson. Mr. Ferguson has been connected with the fan and blower business for the last fifteen years and is well known to the trade throughout Ohio and Pennsylvania.

Business Troubles.

Osborne, Rea & Co., New York, steam fitting and ventilating contractors, whose failure was noted last month, have filed schedules showing liabilities of $128,036 and assets of $49,132, consisting of stock, $5,236; office furniture, $962; tools, $1,940; accounts, $35,181; notes, $5,776, and cash, $37. Among the creditors are the American Radiator Co., $4,471; American Blower Co., $3,294; Diehl Mfg. Co., $7,378; Johnson Service Co., $9,734; H. W. Johns-Manville Co., $5,266, and Niagara Radiator Co., $6,080.

Business Changes.

Spencer Plumbing, Heating & Engineering Co., Spencer, Ia., a partnership composed of J. H. Nichols and T. M. Prall, has been dissolved, Mr. Nichols having purchased the interest of Mr. Prall. The business will be conducted under the same name.

H&M Thermometers

REGULATORS

Automatic Temperature and Pressure

Tycos **Mercury Operated steel construction Recording Thermometers**
All Glass Engraved Stem Thermometers

Hygrodeiks and Hygrometers
Thermo-Electric and Radiation Pyrometers

A broad experience, a perfectly equipped plant enables us to build Thermometers for all purposes, Barometers and Scientific Instruments of accurate register, durable construction, proper proportions and practical design, and we solicit your valued inquiries, cheerfully placing information in your hands.

H & M Type Straight Thermometer with Thread Connection

The H&M Division
Taylor Instrument Companies
Rochester, N.Y.

The *Tycos* Mercury Operated Recording Thermometer

The Air Washer Nozzle That Will Not Clog

There isn't the slightest possibility of clogged nozzles with the Sturtevant Air Washer—Orifices are large—no adjustments—no packing—perfect spray.

Sturtevant (REG. U. S. PAT. OFF.) **Air Washers**

have other desirable mechanical features. Both the strainer and the eliminators are right. We cannot tell all the details here, but expert Heating and Ventilating Engineers have recommended it for such buildings as the New Bureau of Engraving and Printing, Washington; Geology Building, University of Chicago; Allegheny Carnegie Library, Pittsburgh; Erie Theatre, Chicago; New Kansas City Union Railroad Terminal.

Ask for catalog 225-V.

B. F. Sturtevant Company **Hyde Park, Boston, Mass.**
and all principal cities of the world

New Incorporations.

Economy Valve Mfg. Co., Duquesne, Pa., capital, $5,000; to manufacture valves and accessories. Incorporators: William G. Estep and William P. Kroeger, of Duquesne, and Frank J. Hamrock, of Homestead.

Frank & Miller, Buffalo, N. Y., capital, $6,000; to conduct a heating and plumbing business. Incorporators: T. P. Simpson, W. F. Miller and G. W. Frank.

F. W. Spencer & Co., Salt Lake City, Utah, capital, $10,000; to take over the heating and plumbing supply business of F. W. Spencer. President, F. W. Spencer; vice-president, secretary and treasurer, Sarah Spencer.

Bate Boiler Efficiency Co., Dover, Del., capital, $100,000; to manufacture and deal in boilers, cleaners, etc. Incorporators: W. M. Boyd, W. I. N. Lofland and W. F. P. Lofland.

Aetna Boiler Works, New York, capital, $20,000. Incorporators: Harry Lindemann, C. J. Koller and James S. Decosta.

Walsh Mfg. & Heating Co., Brooklyn, N. Y., capital, $10,000. Incorporators: Eugene Walsh, John J. McGovern and William J. Schmacher.

Mack Automatic Heat Regulator Co., Detroit, Mich., capital, $3,000. Incorporators: Philip R. Vernier, Fred R. Beaubin and Arthur Eddy.

Electric Furnace Co. of America, Indianapolis, Ind., capital, $30,000; to manufacture heaters. Directors: Henry H. Buckman, Jr.; George A. Pritchard and Thomas E. Buckman.

Adams, Britz & Co., New York, capital, $25,000; to manufacture heating and ventilating apparatus. Incorporators: P. Eliot Adams, Edwin A. Britz and Thomas Baumgardtner.

Dixon & Ballou, Lockport, N. Y., capital, $100,000; to conduct a heating and plumbing business. Incorporators: Cora B. Merritt, Mary E. Ballou and L. H. Ballou.

Steam Electric Co., Wheeling, W. Va., capital, $25,000; to manufacture light, heat and power apparatus and to conduct an electric, gas and heating contracting business. Incorporators: F. E. Finnegan, F. J. Balleston, H. E. Newman, E. E. Smith and H. M. Walmsley. Office, 20 Sixteenth Street.

Hotstream Heater Co., Cleveland, O., capital, $10,000. Incorporators: E. J. Bokor, E. F. Allen, E. L. Mueller, Don S. Helwick and Jesse Seidman.

E. H. Leonard Co., Detroit, Mich., capital, $2,000; to deal in heating and plumbing supplies.

Catskill Hardware Co., Catskill, N. Y., capital, $30,000; to conduct a contracting business for heating and plumbing systems,

A Positive Proposition

LAVIGNE PACKLESS VALVES ARE THE ANSWER to the demand for an efficient method of controlling heat in vapor vacuum or central heating systems, and they have been proven thoroughly satisfactory during a number of years' exhaustive tests in actual service.

They **positively will not leak** air, water or steam.

They **positively completely open** or completely close with but ⅞ turn of the handle.

They **positively are not** an experiment.

When specifying, installing or using a steam heating plant, insist on having

LAVIGNE PACKLESS QUICK-OPENING STEAM RADIATOR VALVES

Built right—To stay tight.

Made up in six sizes, in Wood Wheel Handle, Graduated Handle Plate, Lever Handle, Extension Handle, Lock Shield, and Right and Left Corner Styles.

Ask your Jobber, or write for details.

LAVIGNE MANUFACTURING CO., Detroit, Mich.

Sturtevant
(REG. U. S. PAT. OFF.)

Interior of second floor of main shed—Boston Commonwealth Pier No. 5—Note how large distributing duct in center of building divides into two branches and supplies warm air ducts in both bays. Consulting Engineers and Designers, Sanitary Engineering Company, Boston, Mass.

HEATING THE LARGEST PIER IN THE WORLD

Sturtevant Fans and Heating Apparatus were installed in the largest pier in the world.

Exposed on all sides and subject to cold winds from the sea, the Boston Commonwealth Pier offers great difficulties in the matter of heating.

How the problem was solved is described in "Heating the Largest Pier in the World"—a reprint from Power. Copy sent on request.

B. F. STURTEVANT COMPANY, Hyde Park, Boston, Mass.
and all principal cities of the world

Sturtevant
(REG. U. S. PAT. OFF.)

automobiles and accessories. Incorporators: H. C. Cowen, O. T. Heath and J. W. Cummins, all of Catskill.

Weber & Hamilton, Long Island City, N. Y., capital, $5,000; to conduct a heating, plumbing and electrical business. Incorporators: M. H. M. Hamilton, D. F. Hamilton and R. P. Weber. Office, at 531 Lockwood Street.

Lane-Stanley Co., Buffalo, N. Y., capital, $5,000; to conduct a contracting business in heating, plumbing and sheet metal work. Incorporators: H. L. Shanley, W. T. Lane and F. G. Lane, all of Buffalo.

Excelsior Heating Co., Kansas City, Mo., capital, $2,000. Incorporators: Thomas H. Priest, John H. Fehlig and Stewart Taylor.

M. F. Smith Heating Co., Lowell, Mass., capital, $100,000. Incorporators: Marshall F. Smith, Leonard Tillinghast and Clinton B. Tillinghast.

Johnson Vapor Heating Co., Boston, Mass., capital, $30,000; to manufacture and sell the Johnson system of vapor heating. Incorporators: Nelson B. Johnson, John M. Sewell and James W. Woodward.

Simon Ventilighter Co., New York, capital, $50,000; to manufacture ventilator and light equipment and controllers. Incorporators: L. Simon, 38 Union Square; S. H. Weinberg, 231 Van Buren Street, both of New York, and S. C. Weinberg, 171 Vernon Avenue, Brooklyn.

Contracts Awarded.

Guiles & Schlosser, Olympia, Wash., heating Federal building in Olympia.

P. J. Sullivan, Boston, Mass., heating and ventilating new school building in Salem, for $18,600. The plumbing contract went to B. J. Driscoll, at his bid of $11,300.

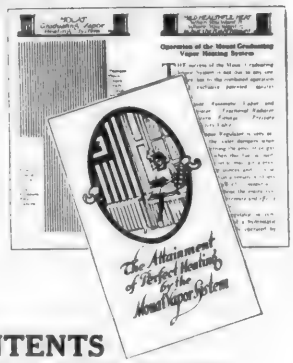
Thompson Plumbing & Heating Co., Seattle, Wash., heating and ventilating the new Commercial School, in that city, for $4,900. The plumbing contract went to R. M. Westover, Everett.

Portland, Ore.—Bids were received as follows for the heating and ventilating of the Kennedy School, Portland: J. F. Shea, $9,265; Kendall Heating Co., $9,875; W. W. Cox, $10,111; Alaska Plumbing Co., $11,490, all of Portland.

Standard Plumbing & Heating Co., Spokane, Wash., heating and plumbing new high school building in Warden, Wash.; also installing heating system and hot and cold water system in Ritzville Hotel, at Ritzville, for $3,500.

Irving & Meier, Detroit, Mich., heating, ventilating and plumbing Garfield School, in Detroit, for $13,692.

MOUAT
Graduating Vapor
Heating System



This is Our Latest Booklet

Send For It

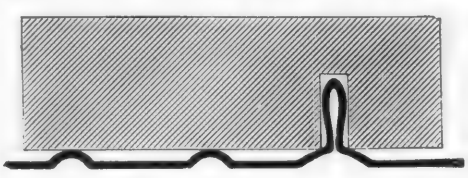
CONTENTS

The Mouat Graduating Vapor Heating System. (General Description.)
Exclusive desirable features of the Mouat Vapor Heating System.
Objectionable features avoided by installing the Mouat System.
Operation of the Mouat System.
The Mouat System also applicable to other systems.
A few users of the Mouat System.
Diagram showing the application of the Mouat System.
Copy of Booklet free for the asking. Write us for our generous proposition.

THE MOUAT-SQUIRES CO.
1244 WEST 4TH STREET CLEVELAND, OHIO

MILD HEALTHFUL HEAT
When You Want It
Where You Want It
In Just the Right Amount

Chamberlin All-Metal Weather Strip



equipment for windows and doors has cured more trouble jobs than any other known apparatus. It standardizes a building in the one part that it is ordinarily weak. It eliminates uncontrolled leakage at windows and doors. Write for detailed information.

CHAMBERLIN METAL WEATHER STRIP CO.
111 THIRD STREET DETROIT, MICH.

When they Needed More they Bought

The Kauffman-Baer Building, Pittsburgh, Pa. Starrett & Van Vleck, Architects. 10 units of "Sirocco" Purifiers are installed in this building.

"Sirocco"
TRADE MARK

Purifying—Cooling and Humidifying Systems

The Engineers of the H. W. Oliver estate, owners of the Kauffman-Baer Department Store Building, installed 6 "Sirocco" Outfits in the store building and when they decided to have purified air in the power plant they ordered 4 more.

"Sirocco" Purifiers, Coolers and Humidifiers are designed right and give the desired results—that's why they are bought in **quantities.**

The very latest improvements made in air purifier design and construction are embodied in "Sirocco" machines.

All spray heads can be flushed simultaneously and **without lowering the efficiency of the purifier.**

The bank of mist covers the entire area of the spray chamber, hence no particle of dirt, dust, etc., can possibly pass through the spray chamber without becoming thoroughly saturated with water. The scrubbing plates (found in no other make) being constantly flooded with water, receive these particles and wash them down into the tank.

Everything pertaining to a "Sirocco" Purifier was designed with the idea of utmost simplicity of operation and to give the best results consuming the least amount of power to do it.

Bulletin No. 2309 gives details. Your request will bring one.

AMERICAN BLOWER COMPANY

DETROIT, MICHIGAN, U.S.A.

Canadian Sirocco Company, Ltd., Windsor, Ont., Manufacturers for Canada.

Seibert Co., San Francisco, Cal., heating and ventilating new Claremont School, in Berkeley, for $3,922.

American Warming & Ventilating Co., Cleveland, O., heating and ventilating two school buildings in Youngstown, O., for $15,000 and $8,130, respectively. The plumbing contracts went to Jacob Brenner at $7,910, and to H. C. Teal at $8,262.

Scott Co., San Francisco, Cal., heating and ventilating new school building at Auburn, Cal., for $3,700.

Dayton, O.—Bids were received as follows for the heating and ventilating of the Dayton View School: W. H. Conklin, Columbus, $25,487; Peck, Anderson & Peck, Cincinnati, $25,961. Plumbing bids: M. J. Gibbons, Dayton, $9,974; Case-Ringlespaugh-Wilson Co., Dayton, $10,536.

Bryce Heating & Ventilating Co., Toledo, O., heating and ventilating school building at Tontogany, for $5,000. The plumbing contract was awarded to the Hoffman & Conklin Co., Columbus, at its bid of $4,000.

Cope Plumbing & Heating Co., Coeur d'Alene, Idaho, heating and ventilating Lakeview, Park, Bryan and Sherman Schools, in Coeur d'Alene, for $5,000.

Nesler & Hammel, Dubuque, Ia., heating and plumbing Sacred Heart School, in Dubuque, for $20,000. Eleven thousand square feet of radiation will be installed.

Bywater Bros., Nashville, Ky., heating and plumbing new apartment building for Keller & Sons, for $10,000.

Edward O. Burrows, Boston, heating and ventilating new South Main Street School at Torrington, Conn.

Oshkosh, Wis.—Bids were received as follows for the heating and ventilating of the remodeled high school building in Oshkosh: W. S. Patterson Co., Appleton, $22,972; L. W. Dukerscheim Heating and Ventilating Co., Oshkosh, $23,300; General Heating and Ventilating Co., Milwaukee, $22,417; W. A. Bowers Heating Co., Milwaukee, $25,300; Downey Heating and Supply Co., Milwaukee, $22,950; Thomas Heating Co., Racine, $24,987; Industrial Heating & Engineering Co., Milwaukee, $26,010; Paul E. Mueller Co., Milwaukee, $23,942; F. F. McNichol & Co., Oshkosh, $24,995.

Kielland Engineering Co., St. Paul, Minn., remodeling heating plant in the Sacred Heart Hospital in Yankton, S. D.

San Francisco, Cal.—One of the largest contracts for ventilating fans and air humidifying and cleaning apparatus ever let on the Pacific Coast is being filled by the Clarland Iron Works, of Seattle. The equipment is for the new $2,500,000 city hall in San Francisco. The equipment, which includes six air washers, will be capable of supplying 17,000,000 cu. ft. of air per hour, heated, washed and delivered throughout the building, as well as removing the vitiated air. The fans are of the multiblade type, developed by the Clarland Iron Works.

Alaska Plumbing Co., Portland, Ore., heating and plumbing Tudor Arms Apartments, at Eighteenth and Couch Streets, for R. F. Wassel, for $14,500.

Jos. A. Langdon & Sons Co., Pittsburgh, Pa., heating and ventilating McKeesport Technical High School for $31,000.

Slayden & McNabb, Waverly, Tenn., heating, plumbing and electric wiring new high school building in Camden, Tenn., for $14,800.

Business Chances.

Washington, D. C.—Sealed proposals will be received at the office of the supervising architect, Treasury Department, for the following named work:

Until June 24, 1915, for the construction complete, including mechanical equipment, etc., of the United States Post Office at Mt. Vernon, N. Y.

Until July 2, 1915, for the construction complete, including mechanical equipment, etc., of a two-story and basement building of 17,000 sq. ft. ground area, for the United States Post Office and Court House at Charlotte, N. C.

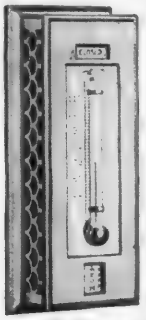
Until July 13, 1915, for the construction of the Interior Department office building at Washington, D. C. The building is approximately 680,000 sq. ft., occupying a site approximately 400 x 400 ft., and is seven stories and basement. Drawings and specifications were ready June 1. Contractors may estimate upon (1) the construction, including the mechanical equipment, except elevators; (2) the construction, except the mechanical equipment and elevators; (3) the mechanical equipment only, except elevators; or (4) the elevators.

Trade Literature.

NIAGARA STEAM AND HOT WATER RADIATORS, BOILERS, TANK HEATERS AND LAUNDRY STOVES is the title of a new catalogue issued by the Niagara Radiator & Boiler Co., North Tonawanda, N. Y. The catalogue covers every style of this well-known line, together with full details regarding sizes, prices, etc. Size, 4x8 in. Pp. 112.

TESTING V-NOTCH METERS, used in the Cochrane metering heater, is the title of Engineering Leaflet No. 18, published by the Harrison Safety Boiler Works, 3189 North 17th St., Philadelphia, Pa. The measurement of water has become a subject of great in-

Johnson Model Thermostat



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only four and three-quarter inches long, two inches wide and one inch deep, copied from the design of one of the greatest architects in the country, with the "Open and Closed" INDICATOR to show when the heat is turned "On" or "Off" and a POSITIVE SHUT-OFF for fresh air sleeping rooms. It is the final touch to an ideal heating system.

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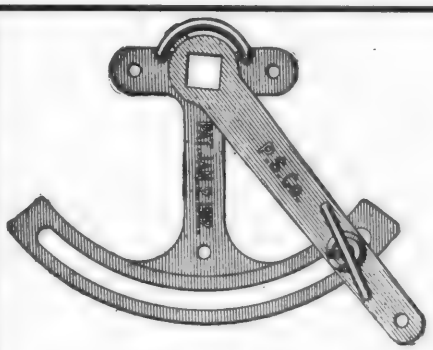

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"Furnish and install, in all heat and vent flues, adjustable Dampers and, in all branch ducts, movable Deflectors equipped with Parker Damper Quadrants (manufactured by the Parker Supply Company, 515 West 45th Street, New York City), which permit of the Dampers and Deflectors being held in any desired position."

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It has only two parts—lever and frame. And the lever locks right onto the frame, doing away with the need of drilling and the use of pins, springs, nuts, bolts, etc. Result: a better and neater job.

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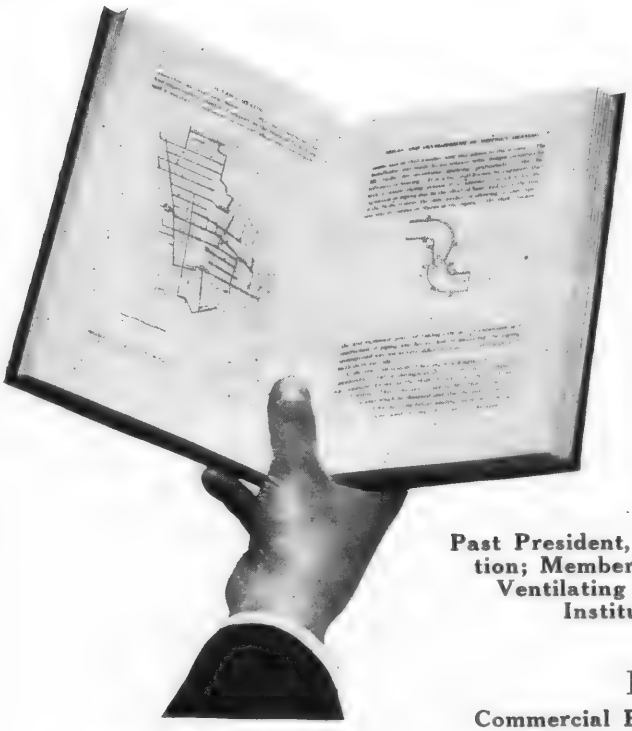

District Heating

A Full and Practical Treatise on Central Station Heating

by

S. MORGAN BUSHNELL

Past President, National District Heating Association; Member American Society of Heating and Ventilating Engineers; Member American Institute of Electrical Engineers

and

FRED. B. ORR

Commercial Engineer, Illinois Maintenance Co.

This book not only imparts a general knowledge of District Heating to those who wish to study the subject, but is also designed to promote the interests of District Heating companies. For this purpose various points on economical operation are suggested, as illustrated in the methods practiced by companies which have made a success in this line of work. Comparative data are also presented indicating the prices that can reasonably be charged for heating service.

CONTENTS

CHAPTER I—Origin and Development of District Heating
CHAPTER II—Selling of Heat
CHAPTER III—Heat Distribution Systems
CHAPTER IV—Metering
CHAPTER V—District Heating Stations
CHAPTER VI—Methods of Estimating Heating Requirements in Buildings
CHAPTER VII—Estimating Miscellaneous Steam Requirements in Buildings
CHAPTER VIII—Relation between Heat Load and Electric Load in Buildings
CHAPTER IX—The Use of Heating Data in Connection with Estimating on the Cost of Isolated Plant and Central Station Service
CHAPTER X—Relation between Central Station Heating and Central Station Lighting and Power

"District Heating" contains all the important data regarding the development of central station heating and is an invaluable handbook, not only for central station engineers, but also for those contemplating taking up this business which is rapidly becoming one of the largest and most important in the country.

Size, 6 x 9 in. 300 pages. 81 Figures.

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1123 Broadway, New York

terest, especially to central station heating companies. The feed water meter has been described as a sort of cash register for the coal pile, since it keeps a record of the returns in amount of water evaporated for the expenditure of fuel. This publication is a reprint of two papers on the V-notch weir as used in the Cochrane metering heater. The earlier paper, by James Barr, describes tests made at Glasgow University in 1907-1909, while the other paper, by W. S. Giele, describes the testing apparatus installed by the Harrison Safety Boiler Works. Size 6x9 in. z (standard). Pp. 48.

THE FAN THAT WON THE SUIT is the title of a circular calling attention to the decision of the United States Circuit Court of Appeals in favor of the B. F. Sturtevant Co., of Hyde Park, Mass., in the case of the infringement suit instituted by the Sirocco Engineering Co. According to the decision the evidence established the Sturtevant multivane fan to be a new and important invention.

CHICAGO PUMP COMPANY'S BULLETIN 26 is a unique publication, calling attention to the wide experience gained by this company as a leader in improving and designing pumping machinery. Special attention is directed to this firm's line of multi stage turbine pumps, embodying the same principle and design in construction as do the high grade turbine pumps of large capacities. The company states that it was the first to build a condensation pump designed especally for such service and is the only company at the present time that automatically controls its outfit by the tilting of the receiving tank instead of using a float within the receiver. Numerous illustrations are included, showing the variety of the line and the various uses to which they are put in actual service. Size, 9x11½ in. Pp. 16. (Loose binding.) Published by the Chicago Pump Co., Chicago, Ill.

$10,060 WORTH OF VENTILATORS IN ONE SINGLE ORDER, said to be the largest in the history of the business, is announced as having been recently placed by one of the leading electric companies for the Kernchen Siphonage ventilators, made by the Kernchen Company, Chicago, Ill., and noted in a recently-issued circular. The reverse side of the circular shows this interesting apparatus.

KNICKERBOCKER HEAT GENERATOR for hot water heating systems is brought to the attention of the trade in a handy catalogue which shows the appliance in detail and also typical piping plans illustrating the method of installation. It is installed without drawing down the water in the heating system, being placed on top of the expansion tank. The

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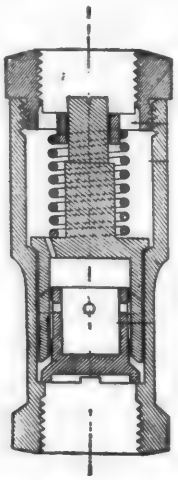
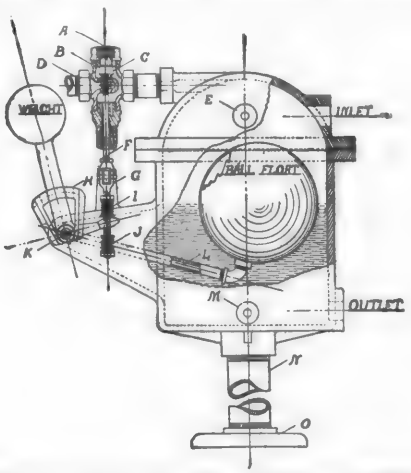
reason for this is that the generator is holding air pressure only. It is described as entirely automatic in action and may be easily applied to old as well as new systems. It is also claimed that the device increases the heating value of the radiation from 25% to 30%.



KNICKERBOCKER
HEAT GENERATOR.

The generator is made of heavy red metal, with spring of phosphor bronze. Size 3¼x6 in. Pp. 16.

LYTTON THERMO SYPHON TRAP, for all types of steam heating systems, which has been brought out by the Lytton Mfg. Corporation, Franklin, Va., is the subject of a well-written bulletin covering details of its construction and operation. This trap, it is stated, was designed as a result of a demand for a device that would drain heating systems and discharge the condensation direct to the boiler, regardless of the conditions in the boiler or system. For instance, there might be from 1 lb. to 10 lbs. pressure on the boiler and 1 in. to 10 in. vacuum in the system, yet the trap is designed to operate in the same positive way. The company announces that the trap has been tested under every condition that could develop in any type of steam heating system, with highly satisfactory results. In the operation of the trap the compound steam and vent valve is actuated by the rise and fall of the ball float which moves weight rocker H and this in turn carries the weight to the right or left beyond a vertical position. When the float goes to the bottom of the trap the weight falls to the right and closes the steam valve and opens the vent. When the float rises to the top the weight tumbles to the left and closes the relief C and opens the steam valve. Buffer springs I and J are intended to absorb the shock of these movements and to make the operation noiseless. The exclusive feature in connection with the design of the float is that it is always in direct communication with the atmosphere and any moisture that may sweat through the metal is instantly



SECTIONAL VIEW OF THERMO SYPHON TRAP.

injected on each upward movement of the float through port L. The company also manufactures the Lytton steam and return traps, reducing valves and blow-off valves.

PUMPING MACHINERY, devoted to the product of the American Steam Pump Co., Battle Creek, Mich., is the title of a series of 22 bulletins made up for loose-leaf binding and including an expansible cover. In addition to describing and illustrating the company's line of Marsh and American pumping out-

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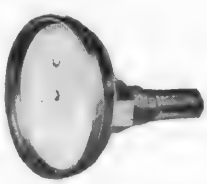

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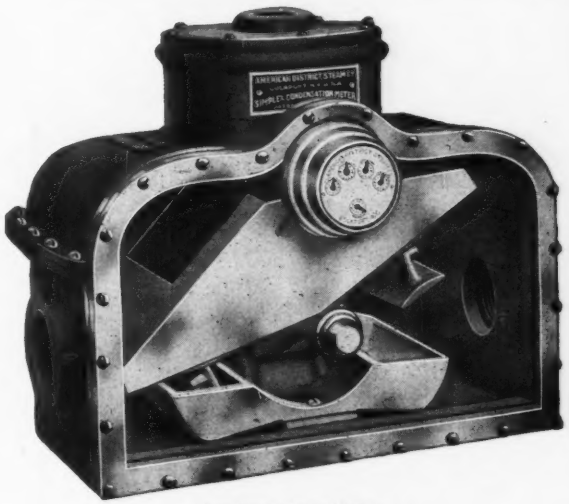
Opportunity Talks No. 3.

The Turning Point in the Success of Central Station Heating



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"Glass Front Exhibition Type"

The success of district heating companies like water, gas, and electric light companies, dates from the adoption of the meter system of charging. Today this method is in such wide use as to be practically universal.

Study the records of plants selling steam on a meter basis and prove for yourself the feasibility and profit of central station steam heating service. Little or no attention was given in former days to the matter of the amount of radiation compared with the cubical contents, wall and glass surface, nor was any distinction made between direct and indirect radiation, ventilation, etc.

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fits, the bulletins contain a quantity of pump data. Separate bulletins are devoted to the Marsh steam pump, Marsh boiler feed pumps, Marsh tank pumps, Marsh vacuum pumps, including those with jet condensers; Marsh automatic boiler feed pump and receiver, and Marsh air compressors. The line of American pumps shown and described include packed piston pumps, outside center packed plunger pumps, compound pumps, improved air compressors and belt-driven dry vacuum pumps. Size 6x9 in. (standard).

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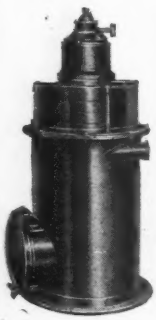

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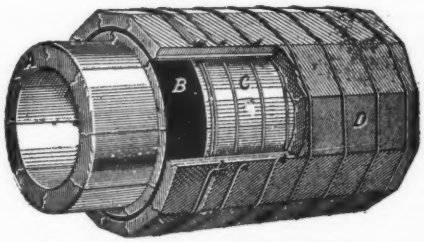

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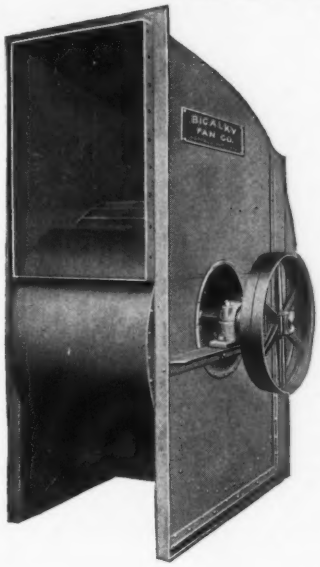

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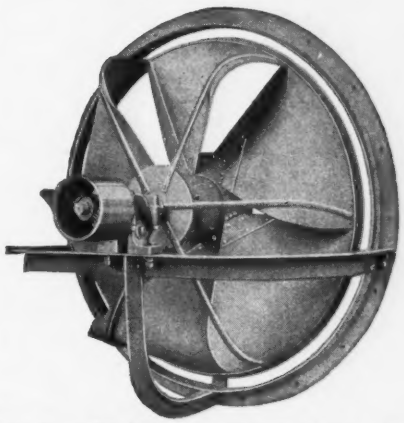

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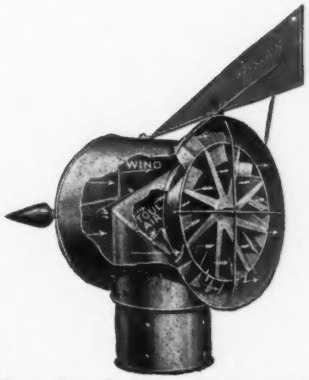

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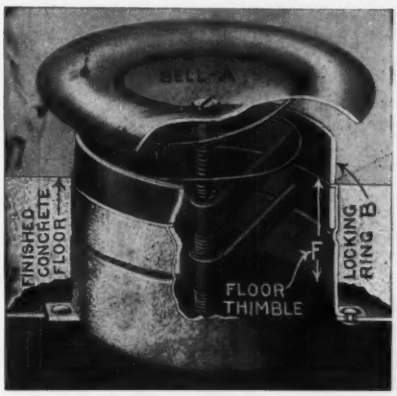

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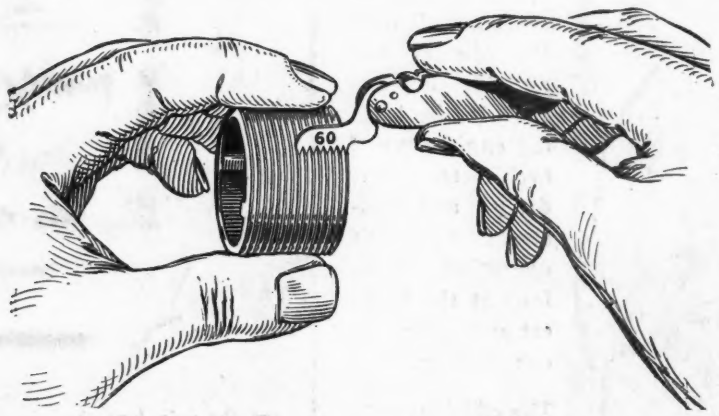

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